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Tonsil Tags

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BORYS TOLCZYNSKI

It is an embarrassing experience for any surgeon to find tonsil tags as an end result of what he thought was a skillfully performed tonsillectomy. Whether a tonsil tag is a postoperative remnant or is regenerated tonsil tissue, it has definite clinical significance in everyday practice and is sufficiently important to require further investigation.

Incidence

In surveying the literature on tonsil tags, one gains the impression that really complete tonsillectomies are exceptions. As shown in table 1, the incidence of tonsil tags ranges from 22.4 per cent to 82 per cent. The marked differences are due to the difficulty in identifying a true tonsil tag and to the varied clinical material.

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This high incidence has not changed since 1910 when the first publication on tonsil tags by Coues[1] appeared, despite the improved technic of tonsillectomy. A report published some 40 years later by Hyde[12] still listed a formidably high incidence of 68 per cent.

Etiology

Etiologically, there are two groups of patients with tonsil tags. The first group are those whose tonsils have been imperfectly removed, and for this reason the tonsil tags are evident in the first days following operation. It is believed that if a tonsil is removed thoroughly it will not recur. Thus, faulty operative technic is to blame for the tonsillar remnants in this group. They may result from failure to engage the whole tonsil, especially its lower pole, in a Sluder or wire snare tonsillotome. That is why some surgeons[12,13] remove the tonsil by sharp dissection without snaring or guillotining. Tonsil tags frequently are located at the lower pole in the region of the plica triangularis. Resection often is incomplete in this area because of fear of hemorrhage, excessive scarring and contraction. When the

TABLE 1

INCIDENCE OF TONSIL TAGS

AUTHOR(S), YEAR	NUMBER OF TONSILLECTOMIZED PATIENTS	INCIDENCE OF TONSIL TAGS *(Per cent)*
Coues,[1] 1910	40	30
Clark,[2] 1913	143	41.25
Rhoads and Dick,[3] 1928	403	73
Bradley,[4] 1930	167	82
MacLaggan,[5] 1930	100	49
Kaiser,[6] 1930	1000	38.1
Epstein,[7] 1937	540	62.2
Campbell,[8] 1939	621	77.3
Lüscher,[9] 1943	224	32
Sputh and Sputh,[10] 1946	285	80
Gooch and Lillie,[11] 1948	400	22.4
Hyde,[12] 1951	1000	68
Tolczynski, 1957	167	30.35

Sluder method is employed, tonsillar remnants are often left behind in this location.

The second group of patients are those in whom tonsil remnants are discovered months or years after tonsillectomy, despite the fact that at the time of operation the surgeon was satisfied that the tonsils had been removed completely. Richardson[14] has stated that there can be no doubt that true tonsillar tissue can develop in the tonsil bed months or years after a perfect tonsillectomy. This unexpected appearance of tonsil tags years after a perfect tonsillectomy is ascribed to the presence of microscopic extracapsular lymphoid tissue embedded in the plica triangularis, plica semilunaris, plica retrotonsillaris, plica supratonsillaris, the pillars, and the region between the base of the tongue and the tonsil (infratonsillar nodules). This lymphatic tissue cannot be removed at operation because it cannot be detected. Later, it hypertrophies, and this accounts for the appearance of tonsil tags.

Such recurrences are not due entirely to faulty tonsillectomies but are the result of hyperplasia of extracapsular lymphoid tissue.[15,16] Leshin and Pearlman[15] stated that no operative technic can prevent the future recurrence of lymphoid tissue in the region of the tonsil bed, as the tunica propria of the mucosa around the tonsillar fossa contains lymphoid tissue which grows into the tonsil bed in the process of epithelization of the wound postoperatively.

In children, the tendency of nature to replace lymphatic tissue is a well-recognized fact, and this tendency is considered a compensatory hyperplasia.

Pathology

A tonsil tag may appear as a small island of lymphatic tissue in the tonsillar fossa or as a larger tonsil remnant, the size depending on what has been left after an incomplete tonsillectomy and on the amount of hyperplasia of lymphatic tissue which occurred postoperatively. This hyperplasia is more pronounced in children, and the removed tonsil tag resembles a hypertrophied tonsil. Repeated bouts of infection and inflammation may increase its size. The adhesions and synechiae surrounding the tonsil tag also vary in amount and thickness. Sometimes the tonsil tag appears to be buried under these fibrotic structures.

The following histopathologic changes have been found in our own specimens and noted in other investigations:[11,17] moderate atrophy and ulceration of the covering squamous epithelium of the tonsillar crypts, cryptal stasis with pus cells, abscess formation in the cryptal area, increase in keratinization of the squamous epithelium, enlargement and distortion of the follicles, proliferation of lymphatic tissue, endophlebitis of small tonsillar veins, and fibrosis of adjacent muscle fibers, capsule, subepithelial tissue, parenchyma and trabeculae.

Of all the histopathologic changes, fibrosis

is the most significant and the most frequently encountered as a result of postoperative healing. This persistent fibrosis accounts for the distortion of the follicles, cryptal stasis, distention of crypts and abscess formation, atrophy of the covering squamous epithelium, thickening of the capsule, and induration of the reticulum, with loss of elasticity of the tonsil tissue.

Identification of a Tonsil Tag

Clinically, we can divide patients who have undergone tonsillectomy into three groups: (1) those who are convinced that their tonsils have "grown back" and in whom examination of the pharynx is negative; (2) those who do not have any complaints but in whom examination reveals large tonsil tags; (3) those with localized or generalized symptoms in whom pharyngeal examination discloses infected tonsil tags.

Tonsil tags may be unilateral or bilateral; when unilateral they are more often seen on the right side. They may appear either at the upper region of the tonsillar fossa or in the lower region (more often the latter), or in both areas. Their size varies markedly. They may represent bits of the faucial tonsil not disturbed by dissection, or unexposed extracapsular irregular clumps of tonsillar tissue which were left in the peritonsillar space and could not have been removed at tonsillectomy.

Not every accumulation of lymphoid tissue in the scarred tonsillar fossa is a tonsil tag. The presence of tonsillar crypts identifies the tonsil tag. If the plica triangularis adjacent to the tonsil was not removed, it may simulate a tonsil tag, especially if it is inflamed and edematous.

What seems to be a tonsil tag lying in the tonsillar fossa should be distinguished from an outgrowth of the lingual tonsil. This is identified by depressing the tongue downward and forward; lingual outgrowths move with the tongue and free from the tonsillar fossa.

Finally, one should distinguish between a tonsil tag and an accumulation of adhesive tissue in the tonsil bed. In some instances an infected tonsil tag is buried under such tissue. Tenderness on direct palpation of that scar tissue in the tonsillar fossa may indicate the presence of a tonsil tag. Sensitivity to deep pressure of the jugular vein, and induration and tenderness on external palpation of the tonsillar fossa below and behind the mandibular angle may further confirm the presence of an infected tonsil tag. Enlargement and tenderness of the submaxillary lymph glands usually accompany infected tonsil tags.

Clinical Significance

As is true of adenoid remnants, tonsil tags are more often infected than are intact tonsils. In many cases the resulting condition is worse than the one that led to tonsillectomy. It has been demonstrated that tonsil tags have been more heavily infected than tonsils removed for the first time,[18] containing such morbid bacteria as *Streptococcus viridans*, hemolytic streptococci, *Staphylococcus aureus* and others.[17]

The clinical significance of tonsil tags concerns the production of pathologic changes locally and in distant tissues. Repeated attacks of acute tonsillitis or quinsy are the result of local involvement, whereas focal infection represents an attack on distant tissues through the infected tonsil tags. The theory of a focus of infection is based on the conjecture that the tonsillar crypts serve as ideal cultivating tubes for morbid bacteria and that these bacteria evolve from such foci and influence the course of certain general constitutional diseases.

Before tonsillectomy, there is constant drainage of infectious material from the tonsil surface into the oral cavity, and only part of this material is absorbed into the bodily tissues. When infected tonsil tags are present, the adhesions and fibrous tissue which usually cover them prevent drainage into the oral cavity. Thus, all the toxic material is drained and absorbed into the lymphatics and small veins.

Although the significance of focal infection has diminished as a result of suppression of tonsillar infection with chemotherapy and antibiotics—and, in turn, suppression of its morbid effects on distant tissues—nevertheless, infected tonsillar tags may be responsible for many relapses of rheumatic fever, fibrositis, septicemia, endocarditis, chronic nephritis,

chronic phlebitis, recurrent cervical lymphadenitis, chronic purulent otitis media, and chronic iritis, iridocyclitis and retinitis.

Meyer[17] has elaborated the following mechanism of focal infection in cases of arthritis: From the primary focus of infection in the tonsil tag, via small tonsillar veins, a second focus of infection is established in the jugular vein, resulting in jugular phlebitis and subsequently in polyphlebitis of the peripheral veins. If the veins of a joint are attacked, the resulting proliferative endophlebitis interferes with venous drainage of that joint. The ensuing venous congestion of its linings results in weakening of tissue resistance, leading to arthritis.

The following otherwise unexplained symptoms also are attributed to an infected tonsil tag acting as a focus of infection: subfebrile states, heart palpitations, muscular pain, and, in children, loss of appetite, loss of weight, paleness, listlessness and lassitude.

Indications for Removal

The mere presence of a tonsil tag is not an indication for its removal. The following are indications for removal of infected tonsil tags:

1. Repeated attacks of acute tonsillitis or quinsy.
2. Recurrent cervical lymphadenitis.
3. Chronic purulent tonsillitis manifested by fetor ex ore and local discomfort due to adhesions and cryptal mucopurulent props.
4. Presumed association of the infected tonsil tag with existing uveitis (iritis, iridocyclitis, choroiditis), bacterial endocarditis, juvenile rheumatism and arthritides, or glomerulonephritis, especially when there is a history of recurrent sore throat.
5. Chronic purulent otitis media.
6. Diphtheria carriers, when other treatment has failed.
7. Hyperthyroidism where infected tonsil tags may be responsible for a toxic thyroid.
8. Unexplained prolonged subfebrile and septic conditions.

Treatment

The best treatment of tonsil tags is their prevention. One should perform tonsillectomy carefully by dissection, which enables complete removal of the plicae. In the presence of indications as already listed, the treatment is a secondary operation.

Technic

I shall describe the technic I employ for removal of tonsil tags. There are three prerequisites to the operation: good anesthesia (general anesthesia is preferred, as it provides better exposure; tonsil tags often are hidden); good illumination (preferably a head mirror); and an unimpaired view of the operating field provided by thorough suction of blood at the line of dissection and by hemostasis.

One should conduct the operation just as though he were going to remove a whole intact tonsil. It is not good surgical practice to grasp the salient tonsil tag with a tonsil forceps and put a snare on it; the remainder of the tag which is covered and buried beneath the adhesions and pillars will remain *in situ*.

An incision is made with a sharp knife in the upper part of the tonsillar fossa where both pillars meet. It is continued down to the base of the tongue, outlining both the anterior and the posterior pillars. Then, with Bruenings' or Lothrop's dissector, the pillars are separated from any adhesions and underlying tonsil tissue, especially at the junction of the tonsil and tongue. Sliding away the base of the tongue with Neivert's tongue depressor is more efficient in exposing that junction than is pressing down the base of the tongue with any other tongue depressor.

Thus exposed, the tonsil tag is grasped with an Allis forceps or a White tonsil-seizing forceps and the dissection is continued downward and backward with Fischer's sawlike knife and dissector; this instrument is especially handy when there are heavy adhesions. Thorough dissection also can be accomplished by spreading the branches of tonsil scissors, working between the tag and fibrotic structures and the underlying normal tissue. The surgeon often is surprised at the large size of the tonsil tag thus dissected.

With either Fischer's knife or scissors, the dissection is carried out completely down to the base of the tongue. The inferior pole of

the tonsil often is lobulated, and therefore a tonsil tag in that region will have the same structure and a snare may miss part of it. For this reason it is best to sever the whole dissected tag with scissors.

The line of dissection should be kept clear by thorough suction and by hemostasis. I have found that the tie as used in the Manhattan Eye, Ear and Throat Hospital is extremely time-saving and effective in controlling bleeding points.

After removal of the tonsil tag and thorough hemostasis, meticulous inspection is of utmost importance. In a search for possible remnants, one should lift each pillar by grasping it with an Allis forceps.

Summary

Despite improved technic of tonsillectomy, the incidence of tonsil tags is still very high. The immediate cause is incomplete removal of either the tonsil or its capsule or plicae. The other etiologic factor is redevelopment of extracapsular tonsil tissue or hyperplasia of tonsillar remnants remaining postoperatively. In many instances, tonsil tags are difficult to identify. Their clinical significance is related to the concept of a focus of infection. The main histopathologic feature is fibrosis with cryptal stasis which predisposes to infection and drainage of toxic material to the lymphatics. The best treatment is prevention through complete tonsillectomy by dissection. The technic which I employ for the secondary operation to remove tonsil tags is presented.

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The Inguinal Hernia, Hydrocele and Undescended Testicle Problem in Infants and Children

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INDIRECT inguinal hernias, hydroceles of cord and tunica vaginalis, and maldescent of the testicles together comprise the commonest pediatric surgical problems in infancy and childhood. During the past 10 years over 2500 operations for these defects have been performed at The Children's Hospital in Columbus by many capable surgeons, and a careful study of 753 consecutive cases has recently been completed. There were 652 patients admitted between July 1953 and January 1956 with indirect inguinal hernia or hydrocele, or both, and 101 admitted between July 1950 and July 1956 with maldescent of one or both testes.

H. WILLIAM CLATWORTHY, JR.

MICHEL GILBERT

AMBROSE CLEMENT

Since all these lesions are the result of imperfect obliteration of the processus vaginalis peritonaei and occasionally associated with maldescent of the testicle, they must be considered congenital defects even though there may be little or no clinical evidence of the abnormality at the time of birth. It is necessary, therefore, to understand the normal development of the inguinal area before one can com-

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prehend clearly the aberrations which can occur and lead to defects which may subsequently require surgical correction.

Embryogenesis

The normal gonad (testicle or ovary) develops from the nephrogenic ridge through an agglutination of the sex cells in the retroperitoneal area at the level of the third lumbar somate (figure 1). There follows an apparent caudad migration of the developing gonad which appears to be due to two factors: the disproportionately rapid cephalad growth of the developing embryo, and the caudad migration due to the action of the gubernaculum and gonadotropic hormones.[1] These two mechanisms permit the normal gonad to reach a position in the retroperitoneal area at the level of the internal inguinal ring by the sixth to seventh month of gestation.

Preceding further descent of the testicle in the male or of the round ligament in the female, a peritoneal pouch, the processus vaginalis peritonaei, passes through the internal fascial and muscular layers of the abdominal wall at the inguinal ring, thence downward under the fascia of the external oblique to the external ring and into the labia or the developing scrotum. By the eighth month of gestation the testicle in a normal male has passed through this preformed passage and reached its resting place in the scrotum. In the female the round ligament has progressed to its point of attachment in the region of the labia majora.

During the final month in utero and for perhaps a few weeks after birth the central portion of the processus in the male undergoes an obliterative process. If this important obliterative process is incomplete, irregular or interfered with by some other developmental failure such as incomplete descent of the testicle, an anatomic situation results which subsequently permits the development of inguinal hernia or hydrocele (figure 2).

If the entire peritoneal processus remains unobliterated, a complete or scrotal type of herniation subsequently may develop. If the central third of the obliteration is complete, an inguinal type of hernia with or without a hydrocele of the tunica vaginalis will result.

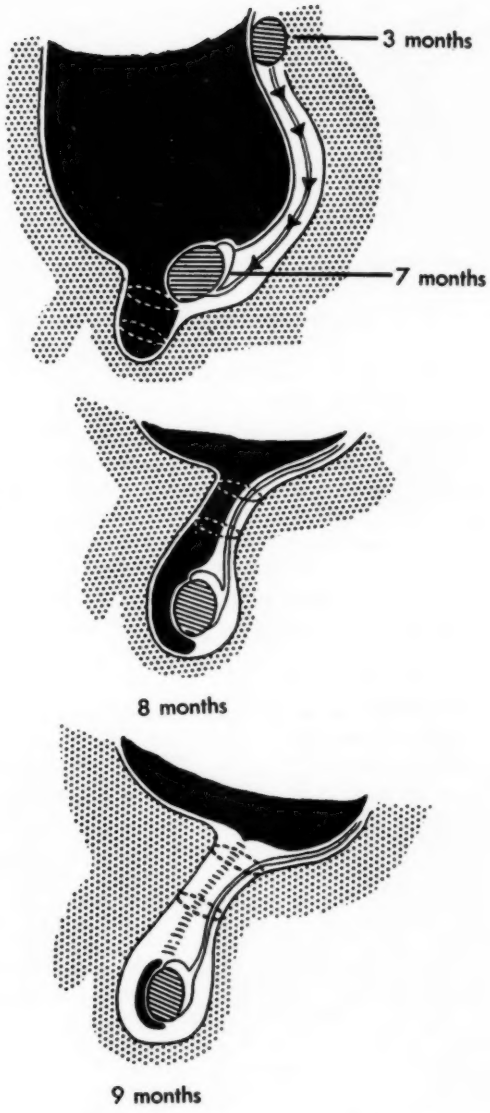

FIGURE 1. Normal development of inguinal area.

Finally, if the obliteration is spotty, there may be one or more hydroceles in combination with a small patency of the proximal sac lying along the spermatic cord or round ligament (canal of Nuck).

Thus the basic problem in every hydrocele and indirect inguinal hernia is a congenital

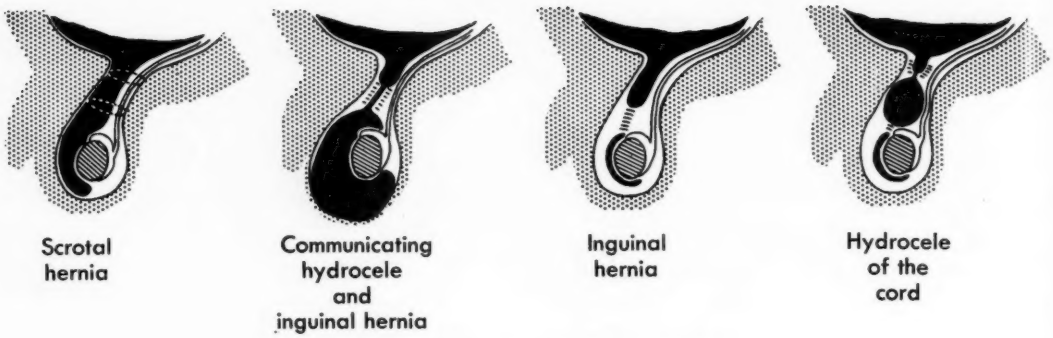

FIGURE 2. Abnormal development of inguinal area.

one, a failure of a testicle to descend properly and the processus vaginalis peritonaei to obliterate perfectly. Subsequently the family or physician's attention will be attracted to this developmental defect when fluid accumulates in a portion of the patent sac as in hydrocele or when an intra-abdominal viscus is forced into this unobliterated space as in hernia.

Indirect Inguinal Hernia

The commonest abnormality of the inguinal region and by far the most troublesome and hazardous is indirect inguinal hernia. Our review of cases included 637 consecutive patients with indirect inguinal hernias (177 with associated hydrocele) for whom herniorrhaphies were performed during a two and one-half year period.

Age, sex and side—Inguinal hernia is more common in early infancy than in late childhood. Almost half the herniorrhaphies were performed on infants in the first year of life (figure 3); 570 (89.5 per cent) of these patients were boys and only 67 (10.5 per cent) were girls (table 1). A patent hernial sac was found on the right side in 58.3 per cent of the boys and in 43 per cent of the girls, whereas on the left side it was patent in 40 per cent of the girls and in only 24 per cent of the boys. The incidence of bilateral hernias was the same for both sexes (17 per cent). These differences between sex and side are best explained by recalling that the descent of the gonad and the subsequent obliteration of the sac proceed more rapidly on the left side than the right and that in the female the process of obliteration of the pouch normally may be completed one month earlier than in the male.

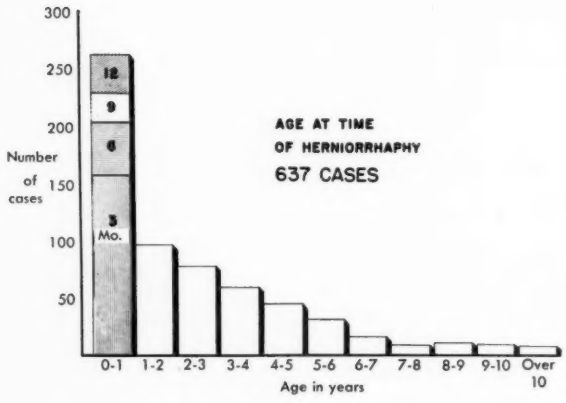

FIGURE 3. Age of patients at time of herniorrhaphy in 637 cases of inguinal hernia.

TABLE 1

RELATIONSHIP BETWEEN SEX AND SIDE INVOLVED IN 637 CASES* OF INDIRECT INGUINAL HERNIA

	MALES *Per Cent*	FEMALES *Per Cent*	PER CENT OF TOTAL
Right side	58.3	43.0	56.5
Left side	24.0	40.0	26.0
Bilateral	17.7	17.0	17.5

*Males, 570 (89.5 per cent); females, 67 (10.5 per cent).

Prematurity—As one might expect with a developmental process occurring in the last trimester, premature infants are prone to have a higher incidence of inguinal abnormalities. Neonatal necropsy studies have demonstrated that only 2 per cent of full-term infants have an open processus vaginalis as contrasted with up to 25 per cent of viable prematures.[2] In this series, 69 (10.6 per cent) of the patients weighed less than 2500 gm. at birth. Bilateral inguinal hernias were more common in infants with a history of premature birth. Twenty-six or 37.7 per cent of such infants had bilateral indirect inguinal hernias as compared with more mature or full-term infants in whom the incidence of bilateral hernia was 17 per cent (table 2).

TABLE 2

69 PREMATURES WITH INGUINAL HERNIA

	PER CENT
Right-sided hernia	37.7
Left-sided hernia	24.6
Bilateral hernia	37.7

Symptoms and signs—In young infants, recurrent fussiness, irritability and apparent colic are the usual symptoms of inguinal hernia. The inguinal lump produced is frequently small and difficult to see, particularly in obese infants with thick suprapubic fat pads. However, a careful inspection of the inguinal and suprapubic area will often suggest the diagnosis by demonstrating an asymmetry of the suprapubic fat pad with a fullness and wideness on the side of the hernia (figure 4a). Occasionally there may be swelling of the scrotum on the involved side due to an excessive accumulation of intraperitoneal fluid in a tunica vaginalis around the testicle.

Palpation of the cord by rolling one's finger across the point where a normal cord or round ligament passes over the shelving edge of Poupart's ligament in the lower portion of the inguinal canal will permit one to determine a thickening of the cord and in certain instances a silk glovelike sensation which is produced by rubbing the walls of the patent hernial sac together (figure 4b). This ability to evaluate a spermatic cord or round ligament for thickness and the presence of a sac is particularly important to the surgeon who must decide whether or not a child with a single clinical hernia has in addition a potential hernia on the opposite side. The common prac-

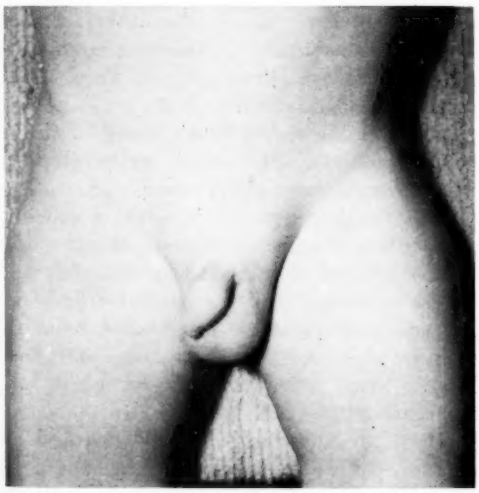

FIGURE 4a. Appearance of inguinal area of infant with history of left inguinal hernia. Note the asymmetry, fullness and wideness of the suprapubic fat pad on left side.

FIGURE 4b. Method used to palpate the cord of an infant when one suspects the presence of an inguinal hernia.

tice of inserting a digit through the external ring has little diagnostic merit, is unpleasant, and has no place in the inguinal examination of infants and children.

Management—In 1952 we summarized our experience with 980 cases of inguinal hernia in infants and children and found that 134, or approximately 14 per cent, were operated on after the hernia had already become complicated by incarceration or strangulation.[3] Of particular significance was the observation that the commonest period for strangulation and incarceration of a hernia in an infant or child is the first three months of life and that over half of these children were known to have a hernia present prior to the development of this complication. Several of these patients were undergoing truss treatment at the time. Similar experiences have been reported by Thorndike and Ferguson,[4] Potts and associates[5] and Gross.[6] It appeared obvious that, as physicians, we were remiss in permitting the most serious complication of inguinal hernia to develop in at least 14 per cent of our patients before advising surgical intervention.

However, since 1953, many physicians in our area have, in the absence of any intercurrent disease, been recommending elective semi-emergency surgical correction of all inguinal hernias regardless of age or weight of the patient. This has resulted in a distinct reduction in the number of emergency herniorrhaphies, and it has led to a progressive increase in the number of herniorrhaphies performed in younger age groups. There have been no deaths from elective herniorrhaphy in our institution for 10 years, during which time the operation has been performed in over 2500 patients. For these reasons we feel that the optimal management of inguinal hernia in infancy or childhood entails early elective surgical cure as soon as the diagnosis is established.

Operative technic—The operation is most effectively done under a general open-drop vinyl ether-oxygen anesthesia although occasionally in a tiny premature infant we prefer local infiltration of 0.5 per cent XYLOCAINE®. A transverse incision is made in the skin fold at the level of the internal inguinal ring. The dissection is carried down through the superficial fascial layers, and the free border of Poupart's ligament is identified and used as a guide as the subcutaneous tissue is dissected free down to the lateral aspect of the external ring. The canal is opened widely by incising the external oblique fascia. The cremasteric and spermatic fasciae are spread; the hernial sac is dissected free at its mid-portion and divided. The upper portion is then dissected well above the internal ring where it is transfixed and ligated. The distal portion of the sac may then be removed down to the upper pole of the testicle without elevating or displacing the cord.

In females, hernias are frequently of the sliding type and it is advisable to use one or two additional inverting purse-string sutures to obliterate the sac completely without incarcerating the tube or ovarian vessels. In the female the internal ring is closed. The repair of the canal is usually a simple approximation of the external oblique or a modified Ferguson repair as advocated by Ladd and Gross.[7] Subcuticular skin closure is accomplished with 6-0 black silk and the wound is dressed with flexible collodion. In most instances the child can be discharged the following day.

Incarcerated or strangulated hernia—Sixty-four patients were admitted with incarcerated or strangulated hernia (10 per cent of the total herniorrhaphy admissions in this series). The incidence of sex and side was essentially the same as for elective herniorrhaphy. Of these patients, 65 per cent had a previous history of hernia and could have been spared the added risks entailed had an earlier elective herniorrhaphy been performed.

Management—Since 1952 we have endeavored to avoid emergency herniorrhaphy for incarceration if the hernia can be safely reduced by conservative means (table 3). The "conservative therapy" consists of sedation with morphine sulfate, 0.1 mg., or with DEMEROL®, 1 mg. per pound of body weight, following which the child is placed in the exaggerated Trendelenburg position (figure 5) and an ice cap is applied to the inguinal mass. If after one or two hours the hernia has not reduced, gentle taxis may be applied. Of the 64 incarcerated hernias, 35 or 54.7 per cent re-

FIGURE 5. Conservative therapy for recently incarcerated inguinal hernia consists of sedation and placing the child in exaggerated Trendelenburg position as illustrated. Later an ice cap may be applied to the inguinal mass.

TABLE 3

SUMMARY OF 64 INCARCERATED HERNIAS

Incarcerated at time of admission	64
Reduced on ward	35
Emergency herniorrhaphy	29

duced spontaneously within two hours after admission and the remaining 29 or 45.3 per cent required emergency herniorrhaphy. It is of interest to note that the vast majority of these patients with irreducible hernia were less than one year of age (figure 6).

There were 42 cases which had been incarcerated for five hours or less and 33 (80 per cent) of these were reduced by conservative management and subjected to elective herniorrhaphy a day or two later. In 18 of the patients conservative therapy was not attempted because there was already obvious evidence of redness and edema of the inguinal area, scrotum or testicle; clear-cut evidence of small bowel obstruction by physical examination and x-ray; or other evidence to suggest that the entrapped bowel was of questionable viability. Such individuals were subjected to emergency herniorrhaphy following the initiation of nasogastric suction and preparation with adequate intravenous therapy.

Advisability of bilateral explorations—Recently, Rothenberg and Barnett[8] and Mueller and Rader[9] have reported and recommended routine bilateral explorations in all infants and children with a clinical hernia on one side. The former authors demonstrated in 37 of 50 infants (74 per cent) that a potential hernia was present on the unsuspected side. In the latter authors' series of 90 cases the incidence of positive contralateral findings was 65 per cent. We have performed only 47 such inguinal explorations and found 31 hernias on the contralateral side (table 4). In 20 patients with a known right-sided hernia, we found 11 patients or 55 per cent with a hernia on the

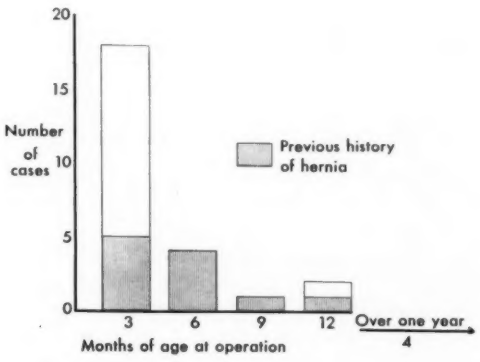

FIGURE 6. The majority of patients with irreducible incarcerated hernia (25 of 29 patients) were less than one year of age; emergency herniorrhaphy was required.

TABLE 4

INGUINAL EXPLORATION IN PATIENTS WITH A SINGLE HERNIA

	NUMBER OF CASES	HERNIA PRESENT	NO HERNIA	POSITIVE EXPLORATION *Per Cent*
Right herniorrhaphy, left exploration	20	11	9	55
Left herniorrhaphy, right exploration	27	20	7	74
TOTAL	47	31	16	66

left side. However, in 27 patients with a known hernia on the left side we found 20 or 74 per cent who also had a patent hernial sac on the right side. The incidence of positive explorations was about the same in each age group (table 5).

On reviewing the entire series of 637 patients we found that only 29 or 4.5 per cent had returned to the hospital for repair of a hernia on the contralateral side. For the present, therefore, we do not recommend bilateral inguinal herniorrhaphy except when there is some reason to believe the exploration will be positive. At present these reasons include a strong familial history of congenital hernia, a history of premature birth, a history of hydrocele on the side in question, an incompletely descended testicle, and evidence of incomplete obliteration of the tunica vaginalis on physical examination, such as thickening of the cord structures or a palpable sac. We feel that by restricting explorations to this group of patients we may be able to increase the effectiveness of bilateral exploration sufficiently to warrant its routine use in this particular group of patients.

TABLE 5

AGE OF PATIENTS WITH POSITIVE INGUINAL EXPLORATIONS

AGE	NUMBER	BILATERAL HERNIAS FOUND	
		Number	*Per Cent*
One month to one year	9	7	78
One to two years	7	5	71
Two to four years	12	10	83
Four to six years	11	3	27
Over six years	8	6	75

Hydrocele

Hydrocele apparently is the second most common presenting abnormality of the inguinal area. There were 192 such lesions in this series (177 with associated hernia). The type of hydrocele seen depends on the vagaries of the obliterative process in the processus vaginalis. These hydroceles are usually oblong in shape, soft, smooth, nontender and transilluminable. Most commonly, hydroceles involve the tunica vaginalis; however, they can appear anywhere along the spermatic cord in the male or along the round ligament in the female. If the processus has a narrow neck of patency at the level of the internal ring which will admit intraperitoneal fluid but not a viscus, a so-called communicating hydrocele is produced. Fortunately the condition usually is asymptomatic unless the lesion is extremely large or tense.

Management—The small, soft hydrocele of the tunica vaginalis commonly seen at birth usually persists for a few weeks or months and appears to have little clinical significance. Such lesions should not be aspirated or operated on since they usually disappear spontaneously. By contrast, a hydrocele which persists, becomes tense and produces mild discomfort, or changes in size from day to day (a communicating hydrocele) will require surgical intervention to effect a cure.

In the vast majority of such patients, regardless of their age, a patent hernial sac will be found above the hydrocele. In this series 192 hydroceles were encountered; 177 were

associated with a patent hernial sac, and in only 15 instances a hernia was not found (table 6). Potts, Riker and Lewis[5] found in their series of 600 inguinal operations in infants and children only one case of hydrocele not associated with a patent hernial sac. For these reasons we feel that the transscrotal hydrocelectomy has no place in the treatment of this lesion in infancy and childhood, since the surgical procedure recommended for hydroceles is essentially the same as that for an indirect inguinal hernia and is best accomplished through the inguinal crease incision. In most instances the testicle need not be delivered, as good results have been obtained when a small cuff of processus vaginalis around the testicle remains.

TABLE 6

HYDROCELE AND HERNIA IN INFANTS AND CHILDREN

	HYDROCELECTOMY	
	Number	*Per Cent*
Associated with hernia	177	92
Without hernia	15	8
	192	

Undescended Testicle

Cryptorchism or "hidden testicle" is the third most common developmental abnormality of the inguinal area. (Approximately 0.8 per cent of the male population are so afflicted.[10]) Yet, there are few problems in medicine today about which there is so much divergency of opinion regarding optimal therapy and the results expected therefrom.

The infant or child with one or more testicles outside their normal scrotal position demands careful evaluation before a proper diagnosis can be reached. There are three types of patients which may appear to have undescended testes.

The first group includes those children with a "bashful testicle," a testicle which can be retracted by the cremasteric muscles from the scrotum into the inguinal canal or abdomen during times of stress, such as a visit to the doctor. The scrotum is symmetrically well developed. Such a testicle may be found in the canal and frequently can be pushed down into the well-developed scrotum at examination or will be noted by the parents to be in the scrotum at times of relaxation such as during sleep or when the child is bathed. This child does not have an undescended testicle.

The second type is the child who has a descended testicle in an abnormal position—the so-called ectopic testicle. The testicle may be in the perineum, at the base of the penis, in the femoral triangle, or in the opposite scrotum. The spermatic cords are sufficiently long so that placing the testicle in the scrotum is a relatively simple surgical procedure. A variant of the ectopic testicle which may be easily mistaken clinically for a true undescended testicle is the testis which has gone through the external ring and been deflected upward by an imperforate dartos fascia into a subcutaneous pouch on top of the external oblique fascia. In such instances the cord is also fairly long and it is relatively easy for the surgeon to place such a testicle in the scrotum once the dartos fascia is perforated and the scrotum enlarged adequately.

The third type is the patient with the truly undescended testicle which for some undetermined reason has been arrested in the normal pathway of descent and as a result has developed a very short vascular cord.

In 101 consecutive cases of true maldescent of the testicle there were 90 patients (93.3 per cent) whose abnormality placed them in the last category and 11 (6.7 per cent) whose testicles were in an ectopic position.

Significance—A clinical hernia or an anatomically patent processus vaginalis was present in 98 per cent of our cases of testicular maldescent. Of these patients, 11 per cent came to surgery in early infancy because of repeated episodes of incarceration of the hernia. Torsion of the testicle is more prone to occur in children with undescended testes since such a testicle lies relatively free and unattached within the peritoneal sac and is more subject to minor traumatic episodes than one which lies in the scrotum where the shocks and blows are cushioned.

Psychologic disturbances are not uncom-

mon in children who enter school with maldescended testes since children of this age in general do not accept this cosmetic aberration lightly. Orchiopexy performed in a preschool child will, therefore, certainly be worthwhile if it will prevent such psychologic disturbances.

The prime reason for concern over an undescended testicle is the possibility of infertility in a case of bilateral involvement. Normally the scrotum functions as a radiator to dissipate heat around the testicle. The elevated environmental temperature in the inguinal and retroperitoneal area is detrimental to the normal development of the seminiferous tubules, and if the testicle resides in such high temperature areas too long the changes may be irreversible. Moore and Quick[11] have shown by their experimental work that temperatures 2 to 8° C. lower than that normally found in the human abdomen are needed for normal spermatogenesis. Other investigators have rather satisfactorily demonstrated that after five to six years of age there is a tubular developmental lag in a cryptorchid testis.[12-14] Biopsies of cryptorchid testes done at our hospital during the past three years have shown that definite histologic deviations from normal are more commonly observed in patients over six years of age.

The endocrine function of the testicle may also be materially altered by maldescent. Engberg[15] reported that in men with bilateral cryptorchism about one-half of the normal amounts of androgen are excreted and that orchiopexy done after maturity did not increase the hormonal activity of the testes. However, in spite of the low level of androgenic hormones secreted by cryptorchid testes, the amount is sufficient for normal development of secondary sex characters at puberty and thus to encourage the surgeon to avoid removing a testicle even though a satisfactory orchiopexy could not be performed.

Treatment—Each child with a testicle outside the scrotum must be examined very carefully prior to the initiation of any given treatment or the results will be difficult to evaluate. We feel that the majority of therapeutic triumphs which have followed the administration of gonadotropic hormones have been achieved in those individuals who in reality had "bashful testicles" which would have responded equally well to shots of subcutaneous saline or "tincture of time." If the testicle is ectopic or truly undescended, such hormonal therapy does not spare the child an eventual operation since it is incapable of eradicating the hernial sac and certainly cannot perforate a dartos fascial layer which is obstructing the normal descent of the testes in the vast majority of these cases. We have therefore discarded gonadotropic hormone therapy as needless, expensive and painful for routine cases and use it only in those few patients with hypoplastic genitalia including bilaterally undescended testes and other evidence indicating hormonal imbalance.

The small group of children with ectopic testicle or a testicle in a subcutaneous pouch usually have sufficiently long vascular structures so that an orchiopexy can be done at any age with an excellent result, at which time the omnipresent hernial sac can be eradicated simultaneously.

In the remaining majority of patients with truly undescended testes we prefer to perform elective orchiopexy and herniorrhaphy in the preschool period, usually at five to six years of age. A successful procedure at this time frees the child of psychologic stigmata, avoids developmental lag in tubular growth, cures the hernia, and is not a difficult surgical procedure for one who is experienced in pediatric surgical problems.

The technic used in orchiopexy is the one stage operation as outlined by Gross.[6] The principle of this technic is to bring the testis into the scrotum without placing tension on the structures of the cord. The limiting factor to the descent of the testicle is usually the spermatic vessels. The vessels must be dissected from the retroperitoneal area, and displaced medially by dividing the lateral spermatic ligament and posteriorly by taking down to the posterior wall of the canal and dividing the deep epigastric vessels to achieve adequate length. The dartos fascia is perforated and the scrotum enlarged. The testicle is then secured in the new position for five or six days by attaching the inferior pole of the testicle to a

silk suture which in turn is connected to a light rubber band affixed to the opposite thigh. We do not perform a Torek type, two stage procedure since we feel that this manner of unyielding anchorage is too rigid and exposes the cord structures to undue tension which may initiate spasm, obliteration of the vessels, and testicular atrophy.

Fortunately, in 97 of the 101 orchiopexies performed by this technic it has been possible to place the testicle in the scrotum. In the remaining instances the testicle has not been removed but rather has been placed in the canal or as far down as possible in anticipation of a subsequent surgical procedure. A properly performed orchiopexy should cure the hernia, leave a viable testicle in good cosmetic position out of harm's way, and in the vast majority of cases permit normal spermatogenesis.

Conclusions

Six hundred and fifty-two consecutive indirect inguinal herniorrhaphies or hydrocelectomies and 101 consecutive orchiopexies performed in infants and children are reviewed.

Incarcerated hernias represented about 10 per cent of the total herniorrhaphy admissions in this series. Their management is discussed.

Contralateral side inguinal exploration for hernia seems indicated in children with history of prematurity, family history of hernia, history of hydrocele, or clinical evidence of a hernia such as thickening of the cord or palpable sac.

Hydrocelectomy in children should be performed through an inguinal incision and should include removal of the patent hernial sac above the hydrocele.

Orchiopexy and herniorrhaphy is the treatment of choice for truly undescended or ectopic testicles and is best accomplished before the child is six years of age.

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Ulcerative Colitis; Observations on Its Etiology, Course and Management

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ULCERATIVE colitis is an acute and chronic, inflammatory and ulcerative disease of the colon and rectum of unknown etiology. While it is not as common as peptic ulcer or irritable colon, its incidence is higher than is generally appreciated. In the absence of proctoscopic study and roentgenographic examination of the colon, many relatively mild cases probably are not recognized. It appears that ulcerative colitis is increasing in frequency, but this trend is difficult to document.

Some interesting geographic variations in the occurrence of the disease are noted, but this aspect of ulcerative colitis has not been studied sufficiently. Intriguing differences also are noted in relation to economic and intellectual levels. Apparently it is uncommon among the poor and is encountered rarely in large city and county hospitals. It is thought that the disease is more frequent among persons with high intellectual capacities than among those of low intelligence; however, there are numerous exceptions. Further study of the epidemiology of ulcerative colitis thus might reveal significant information concerning the cause and pathogenesis.

Ulcerative colitis most often affects young adults between the ages of 20 and 40 years. It is quite common also in children and infants, and it has been observed in persons over 60 years of age. The sex distribution is approximately equal, with females predominating slightly. Development of the disease in more than one member of the same family is unusual but it may occur, as in brother and sister, or father and son.

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Etiology

The cause of ulcerative colitis remains obscure. The disease has been attributed to infection with bacterial and viral agents, nutritional deficiencies, lack of protective tissue enzymes, proteolytic enzymes acting on the colonic mucosa, allergy to food or bacteria, antigen-antibody reactions within the colon, disturbances of the connective tissue of the bowel, vasospastic phenomena in the colon, and neurogenic and psychogenic mechanisms. However, none of these concepts is established and multiple etiologic factors may be involved. It is of interest that specific entities such as lymphopathia venereum and periarteritis nodosa may simulate the clinical, proctoscopic and roentgenographic features of "nonspecific" ulcerative colitis; perhaps other specific diseases may be recognized similarly.

The high incidence of ulcerative colitis among young persons may suggest tissue hyperreactivity, perhaps hyperreactivity of the colon, as a factor increasing the susceptibility to the disease. Hypersensitivity disorders, including reactions to drugs and to blood transfusions and hemolytic anemia in ulcerative colitis, indicate an acquired or possibly a preexisting immunologic component requiring further study. The occasional association of ulcerative colitis with rheumatoid arthritis, hay fever and asthma, rheumatic fever, glomerulonephritis and lupus erythematosus is of interest in this connection, although there is no evidence that the frequency of the association is higher than that generally expected.

Studies in our laboratory in the past 10 years have led to the production of an acute colitis in rabbits, based on a hypersensitivity mechanism. There is no evidence relating the experimental colitis to the human disease; however, the microscopic changes may be quite similar.

An important relationship exists between ulcerative colitis and emotional disorders. Physiologically, psychogenic tensions are capable of producing hyperfunction of the colon, hyperemia, excessive secretion of mucus, and hemorrhage. Anatomically, an increased number of autonomic nerve ganglia has been noted in the colon in ulcerative colitis, presumably providing a neurophysiologic basis for psychogenically induced hyperactivity of the bowel. Clinically, the onset and recurrences of the disease often are associated chronologically with emotional problems. These involve loss of security, death or separation of parents, anxiety concerning sex problems, and situations involving humiliation.

The incidence of emotional disorders in persons with ulcerative colitis is high. Patients often are immature, insecure, dependent and narcissistic, self-deprecating, hostile and aggressive, and disturbed easily by ordinary events. These problems apparently are not dealt with in the usual manner but are repressed, producing internal conflict. Of interest is the tendency of ulcerative colitis to subside completely during psychotic episodes.

Despite this direct as well as circumstantial evidence for the role of psychogenic factors in ulcerative colitis, numerous questions require clarification: psychosomatic versus somatopsychic relationships, the specificity of the emotional disorders attributed to ulcerative colitis, and the mechanism by which psychogenic situations produce organic changes in the colon. The subjective nature of the psychiatric approach and the infrequency of controls handicap a more definitive evaluation of psychogenic factors in ulcerative colitis. Further investigation of this problem certainly is desirable.

Extensive laboratory studies have failed to establish a bacterial cause of ulcerative colitis. The feces contain increased numbers of microorganisms, but the identifiable flora does not differ from normal. Bacteria which have been implicated include *Shigella dysenteriae, Bacillus lactis aerogenes, Bacterium morganii, B. mucosus capsulatus, Proteus, B. pyocyaneus, Actinomyces necrophorus, Endamoeba histolytica, Escherichia coli, B. faecalis alcaligenes, Klebsiella pneumoniae,* hemolytic colon bacillus, *Salmonella,* diplostreptococci and *Histoplasma capsulatum.* Although the disease has been ascribed to bacillary dysentery, ulcerative colitis seems to be uncommon in regions where the incidence of enteric infections is high, such as Mexico and South America.

The possible role of viruses has not been studied sufficiently. This approach is of interest because of recent evidence implicating viruses in acute enteric infections. Hypersensitivity reactions to bacteria or to bacterial protein also have been suggested, but there is no supporting evidence.

Pathologic Features

Ulcerative colitis affects the rectum, sigmoid and descending colon more often than it involves the cecum and ascending colon, but the entire large bowel is diseased in approximately 50 per cent of cases. The process appears to begin in the mucosa and submucosa and may be limited to these levels, despite frequent recurrences. The pathologic changes vary with the stage and severity of the disease and the presence or absence of complications.

The principal features during the acute phase are diffuse inflammation, vascular congestion, edema, miliary abscesses and innumerable tiny ulcerations. The mucosa is infiltrated with many lymphocytes, plasma cells and eosinophils. Variable numbers of polymorphonuclear cells are present in the lamina propria and in small crypt abscesses. These abscesses tend to rupture under pressure, discharging inflammatory material into the submucosa. The blood vessels are dilated and there are scattered hemorrhages. The number of goblet cells is increased; the crypts are diminished and arranged abnormally. The muscularis and serosa remain uninvolved except in fulminating colitis or in the presence of imminent or actual perforation. Vascular thromboses may be observed, presumably secondary to the inflammation. Although crypt abscesses are emphasized as the initial lesion of ulcerative colitis, they may represent a secondary inflammatory process. Damage and repair are noted simultaneously; healing, as judged by histologic study of biopsies, may be complete.

Residual evidence of ulcerative colitis includes diffuse cellular infiltration of the mucosa and submucosa, fibrosis of the submucosa, aggregates of lymphocytes and, in approximately 20 per cent of cases, granulomas with or without giant cells. In chronic ulcerative colitis, the bowel wall is thickened and fibrotic, the lumen is contracted, and there is a large amount of subserosal fat, even in malnourished patients. The histologic features include vascular engorgement, cellular infiltration and a few crypt abscesses. The submucosa is thickened and fibrotic and contains diffuse cellular infiltrates, lymphocytic aggregates and a variable amount of fat. The muscular layers are hypertrophied. Auerbach's ganglion cells are prominent in fused aggregates, occasionally forming a continuous row separating the muscle layers. Pseudopolyps are common. Ordinarily they consist of residual islands of colonic mucosa after diffuse ulceration and necrosis; their microscopic appearance resembles that of the adjacent mucosa. Inflammatory pseudopolyps result from the accumulation of exudate on the surface of a diseased area of mucosa, organization of the exudate, and secondary superficial overgrowth of colonic epithelium. Adenomatous polyps in ulcerative colitis have the same structure as polyps occurring in the absence of this disease. They develop frequently in ulcerative colitis, presumably as a result of regenerative hyperplasia.

Clinical Features

The usual symptoms of ulcerative colitis are abdominal discomfort and cramping pain, bloody diarrhea, fever, malaise and weight loss. Rectal bleeding may be the only clinical manifestation and may be treated erroneously as originating in hemorrhoids. Fever and vague abdominal distress may be the only symptoms initially, especially in children, and may present a difficult diagnostic problem.

The proctoscopic findings in approximately 95 per cent of cases include hyperemia, edema, ulceration, hemorrhages and friability of the mucosa, and a sanguinopurulent discharge. In approximately 5 per cent, the rectal mucosa may appear normal or manifest only hyperemia and fine granularity.

Despite unequivocal proctoscopic findings, in perhaps 10 per cent of cases the roentgenographic appearance of the colon may be normal, owing to limitation of the process to the mucosa. The earliest roentgenographic

signs of ulcerative colitis probably are loss of haustration and a fine marginal serration. Decreased distensibility of the rectal ampulla may be the only x-ray indication of the disease in relatively mild cases. Other roentgenographic manifestations include ulceration with crater formation, narrowing and rigidity of the colon, pseudopolypoid changes and stricture formation.

The large bowel is involved completely, as demonstrated by x-ray, in 50 per cent of cases. In 40 per cent, varying segments of the bowel are affected. The roentgenologic technic does not always demonstrate the precise anatomic extent of the disease, and histologic study of the bowel is necessary for this purpose. In acute fulminating colitis, the colon may be severely distended. The dilatation has been attributed to lack of ganglion cells in the myenteric plexus, but it seems more directly related to the severe inflammation of the entire bowel wall, fragmentation of the muscle layers, and the associated pericolitis. The terminal ileum is diseased in 10 or 15 per cent of cases. Ileocolitis affects chiefly the distal portion of the small intestine, the cecum, ascending colon and the proximal portion of the transverse colon; these differences in area of involvement appear to represent anatomic modifications of the same disease; however, a different pathogenesis has been suggested.

Ulcerative colitis is characterized by frequent recurrences and remissions, occurring at variable and often unpredictable intervals. Exacerbations are more common in association with intercurrent illness, especially respiratory infections, emotional tension, physical fatigue and dietary indiscretions, and, in women, during the menses. The disease may recur at any time of the year, but our experience indicates that the exacerbations are more frequent and severe during late fall and winter. Despite recurrences, the anatomic extent of the disease, as shown by x-ray, seems to be stationary in perhaps 60 per cent of cases. In 25 per cent, the area of involvement increases steadily and eventually may include the entire colon. In 15 per cent, especially after prolonged and sustained clinical improvement, the x-ray changes of ulcerative colitis may diminish; occasionally there is striking reversibility toward normal. Of interest is the total involvement of the colon early in the disease, within four to six weeks of the onset of symptoms. Occasionally, in severe ulcerative colitis, the active process subsides and bowel function returns practically to normal although the narrowing, rigidity and shortening of the colon persist. Thus, ulcerative colitis may undergo striking remissions. The factors responsible for this transition are not known.

The total involvement of the colon very early in the disease and the lack of progression in cases with limited anatomic involvement initially, despite clinical recurrences, are intriguing observations, perhaps suggesting a process attacking the colon, completely or partially, with maximum intensity at the onset. Such a disease theoretically might be some form of antigen-antibody reaction within the colon. The course of a disease caused by infection or psychogenically induced vascular disturbance of the bowel wall presumably would be more progressive anatomically, in relation to frequent clinical recurrences.

The course of ulcerative colitis is characterized by numerous complications. In the bowel, they include abscess and fistula formation, perforation, peritonitis, stenosis, obstruction, polyps, hemorrhage, carcinoma and steatorrhea. Systemically, the complications include hypoproteinemia, vitamin deficiencies, rheumatoid arthritis, iritis and iridocyclitis, erythema nodosum, pyoderma gangraenosum, glomerulitis, pyelonephritis, nephrolithiasis, pancreatitis, hepatitis, fatty changes and cirrhosis of the liver, depletion of the adrenal glands, vascular thromboses, thrombophlebitis, myocarditis and abscess formation. Occasionally the complications are a more serious clinical problem than the colitis.

The incidence of carcinoma among persons with ulcerative colitis is not known precisely, but it is definitely higher than in the general population. The figures in most clinical surveys range from 1.5 to 3.5 per cent, increasing in surgically resected colons to 4 to 8 per cent. The incidence of carcinoma apparently rises to about 15 per cent in the examination of autopsy material, representing the most

serious and the most carefully studied cases. The carcinoma developing in ulcerative colitis tends to be highly malignant, infiltrating the bowel wall. On the average, patients are 20 years younger than individuals without ulcerative colitis in whom carcinoma of the colon develops. Recurrent hemorrhage, severe weight loss and failure of the disease to respond to treatment may suggest the possibility of carcinoma, but diagnosis usually is difficult. Despite these considerations, patients may survive 5 and 10 years following surgical removal of the tumor.

The study of colon washings with isotonic saline solution by the technic of exfoliative cytology has demonstrated interesting cellular changes in ulcerative colitis. Large colonic columnar cells, closely resembling the large gastric cells observed in patients with pernicious anemia, are demonstrable in most of those with active disease. The increased nucleocytoplasmic ratio and enlarged hyperchromatic nucleoli with chromatin clumping make differentiation from carcinoma very difficult. These cells have not been observed in the normal colon or in patients with radiation proctitis and diverticulitis. They seem to disappear after subsidence of the active disease. Their presence suggests a characteristic cellular response of the colon to chronic inflammation with regenerative hyperplasia, as noted in the stomach of pernicious anemia. The relationship of the "colitis" cells to the problem of carcinoma in ulcerative colitis is not yet known and deserves careful study.

The principal cause of death in ulcerative colitis today, as 50 years ago, is perforation of the bowel and peritonitis. Other causes are massive hemorrhage, carcinoma, vascular thrombosis, malnutrition, and, after ileostomy, ulcerative enteritis with intractable diarrhea and electrolyte imbalance. Improvements in general medical and nutritional care and in chemotherapy have decreased the mortality rate during the past 50 years from 50 to approximately 5 to 10 per cent.

Medical Management

Bed rest, sedation, antispasmodics—There is no specific treatment for ulcerative colitis. Therapy is symptomatic, comprehensive, individualized and prolonged. The immediate objectives are physical and emotional rest, elimination or prevention of infection, maintenance of adequate nutrition, and decrease in the hyperactivity of the colon—the most favorable conditions for healing.

Hospitalization is desirable during the acute or active stage of the disease. Discontinuance of usual activities, respite from responsibilities insofar as possible, and pleasant recreation promote rest and relaxation; these, in turn, help to reduce bowel hyperactivity. Sedation with barbiturates, chloral hydrate, bromides or the newer tranquilizers may be helpful for the same purpose. Sufficient sleep is important and should be facilitated with adequate sedation (Tuinal, NEMBUTAL®, chloral hydrate, DORIDEN® and many similar compounds).

Antispasmodics tend to decrease bowel spasm and hyperactivity. In addition to atropine and belladonna tincture, these compounds include PAMINE®, PRO-BANTHINE®, ANTRENYL®, PRANTAL®, MONODRAL®, PIPTAL®, MARPLAN® and many other equally useful products. The antispasmodics are utilized most effectively to decrease the hyperactive gastrocolic reflex; for this purpose, they are administered before breakfast, at bedtime, and at regular intervals throughout the day. Deodorized tincture of opium decreases rectal urgency and severe diarrhea and may be especially helpful in permitting increased activity outside the hospital or home. Codeine and DEMEROL® are prescribed occasionally for severe abdominal distress; their use should be temporary, however, to avoid addiction. Chlorpromazine may be useful in controlling the pronounced restlessness and agitation encountered occasionally.

Psychotherapy—The orientation of psychotherapy in ulcerative colitis has been expressed picturesquely in the phrase "tender, loving care." Intelligent, relatively superficial psychotherapy is extremely useful, at times excelling other therapeutic measures. It should be friendly, supportive and "ego-strengthening." Unlimited patience, tolerance and courage are necessary in the long-term manage-

ment of ulcerative colitis; confidence, encouragement and an opportunity for emotional catharsis are helpful for this approach.

Psychotherapy usually is conducted more effectively by the attending physician than by a psychiatrist. Formal psychotherapy may be necessary because of serious emotional problems. However, the intensive "uncovering" approach is contraindicated during the acute illness, for the patient then is unable to deal adequately with emotional problems and may be physically incapable of withstanding the organic consequences resulting therefrom. Psychoanalysis has been employed in a small number of cases; the results thus far do not appear striking.

Unfortunately, adequate psychotherapy is not available routinely. The special requirements of this approach, the lack of a sufficient number of hospital beds for prolonged care, and the high cost of formal psychotherapy seriously curtail the applicability of this potentially useful therapeutic adjunct. Frequently, and especially in children, psychotherapy must be directed also to the parents. Therapeutic success, indeed, may depend on the physician's ability to modify the family environment to the benefit of the patient. While the emotional pattern may not change fundamentally, sustained quiescence of the disease during medical treatment not infrequently is followed by pronounced improvement in the patient's emotional status; this change usually is reflected in the acquirement of poise and confidence and a more mature, effective approach to the problems of life.

Diet—Ulcerative colitis is not caused by dietary deficiencies, food allergy or "roughage." Nevertheless, avoidance of mechanical and chemical irritants such as raw fruits and vegetables, fruit juices, spices, carbonate and malt drinks, alcoholic beverages and excessively hot or cold foods decreases bowel hyperactivity, reducing the abdominal discomfort and lessening the diarrhea. A bland, low residue diet providing substantial amounts of protein and carbohydrate usually is prescribed. Powdered foods, rich in carbohydrate and protein, also may be given. However, supplements are less desirable nutritionally than good-quality whole foods. The clinical improvement attributed to the avoidance of bran cereals, milk and fruits probably is related more directly to the removal of high residue foods than to the elimination of presumed allergens. Milk in large amounts may increase the flatulence, abdominal discomfort and diarrhea because milk is a high residue food; however, moderate or small quantities usually are tolerated.

An adequate intake of protein and calories is necessary to correct or prevent hypoproteinemia, a frequent complication caused by reduced intake of food, accelerated tissue catabolism, gastrointestinal bleeding and excessive loss of nitrogen in the feces. A diet containing 2500 to 3500 calories, with 125 or 150 gm. of protein, usually suffices. The cooperation of a competent and interested dietitian is invaluable in providing palatable food and in encouraging patients to eat. Complete nutritional repletion requires time—at least three months or even longer.

Nutritional requirements should not be disregarded in favor of a strict low residue program; usually both objectives are possible. For psychologic reasons, dietary restrictions are less rigid for children with ulcerative colitis than for adults; however, as in the adult, avoidance of irritants provides symptomatic relief. Dietary restrictions should not be permitted to assume overwhelming significance for the patient; conflicts between the limitation of food and psychogenic disturbances resulting therefrom should be resolved in favor of the emotional considerations.

Solutions of 5 per cent dextrose in isotonic saline, containing appropriate amounts of potassium salts, may be required intravenously to correct electrolyte and fluid imbalance resulting from the prolonged, severe diarrhea. Frequent measurements of the serum electrolytes and fluids are the best guides to the amounts needed. Blood transfusions, 500 or 1000 ml., are indicated for severe anemia and in instances of moderate or severe bleeding. Plasma and salt-poor human albumin are useful in the correction of hypoproteinemia; hydrolysates of amino acids are less satisfactory for this purpose. Iron, especially IMFERON®, in-

travenously or intramuscularly, in a total dosage of 1 or 2 gm. given in divided amounts, is very useful in correcting iron deficiency anemia. Iron given orally is irritating to the gastrointestinal tract in ulcerative colitis and should not be prescribed. Vitamins are useful nutritional adjuncts; however, large doses of vitamins, including ascorbic acid, are irritating to the bowel and should be avoided.

Antibacterial therapy—The fever, the inflammation apparent at proctoscopy and on microscopic examination of the bowel, and the complications of abscess and fistula emphasize the role of infection in ulcerative colitis. Bacterial or viral causes have not been demonstrated, but the possibility is not excluded completely. Sulfonamides are prescribed to correct or prevent secondary infection and in the hope of eliminating unidentified infectious agents. There is no consistent correlation between the clinical course and the recognizable bacterial flora of the feces, yet sulfonamide therapy frequently results in definite improvement. The response may coincide with the disappearance of hemolytic staphylococcal, streptococcal or coliform organisms from the feces.

No single sulfonamide excels all others, in our experience, although several appear to be especially useful: sulfaguanidine (8.0 gm. daily), AZULFIDINE® (4 to 8 gm.), sulfadiazine and GANTRISIN® (4 gm.), and SULFATHALIDINE® (6 gm.). The initial favorable clinical response may persist for weeks and months. Frequently, however, it gradually wanes and symptoms return. A change in sulfonamide at this time may renew the favorable response.

Similar clinical improvement may follow the administration of antibiotics. However, broad-spectrum antibiotics may intensify the symptoms, presumably because of undesirable effects on the bacterial flora of the intestine. Antibiotic proctitis and colitis, closely resembling nonspecific ulcerative colitis, also may develop. For these reasons we rarely prescribe antibiotics in ulcerative colitis. Their use for other purposes, as in the treatment of respiratory infections, also is not recommended in ulcerative colitis. On the other hand, penicillin (1.2 million units) and streptomycin or dihydrostreptomycin (1 to 2 gm.) intramuscularly may be very helpful, together with the sulfonamides, in the management of severe colitis and pericolitis and the systemic infections complicating the disease. Treatment is continued for from one to several weeks, depending on individual circumstances; the streptomycin usually is discontinued after five or seven days.

Sulfonamides also may cause undesirable effects, including nausea, vomiting and flatulence, and dermatologic, hematologic and renal complications, although their incidence is low. The temporary antibacterial action, the development of bacterial resistance and the variable clinical response are important limitations to chemotherapy. Nevertheless, sulfonamides appear to be useful adjuncts, decreasing the hazard of purulent complications and probably contributing in some manner to the remissions.

Corticotropin and adrenal steroids—In ulcerative colitis, as in other diseases, ACTH and the adrenal hormones reduce the vascular and tissue response to inflammation and suppress the toxic reaction. There is no evidence of a specific effect. Use of these compounds in ulcerative colitis is based on several considerations: the limitations of conventional therapy; the complications of rheumatoid arthritis, erythema nodosum and iritis; and the usefulness of steroids in the management of these problems.

Despite differences of opinion as to their ultimate value, ACTH and the adrenocortical hormones exert a striking and at times dramatic beneficial effect. The improvement resembles that noted with conventional treatment, but it is more frequent, more rapid and more complete. The response is characterized by the disappearance of fever and toxemia, abdominal distress and bloody diarrhea, and by increased appetite and a remarkable sense of well-being. The changes seen on proctoscopic examination subside more gradually but may disappear completely. Laboratory changes include a decline in the sedimentation rate when elevated, disappearance of blood from the feces, and decreased loss of

fecal nitrogen. Rectal biopsies demonstrate histologic evidence of healing. The loss of basement membrane from the epithelium of the colon and the alterations in ground substance of the connective tissue of the bowel, noted almost invariably in active colitis, seem to disappear following the improvement induced by the adrenal steroids.

The indications for steroid therapy in ulcerative colitis are: recurrent, severe disease not responding to careful medical management in the hospital; acute fulminating colitis; and progressively increasing rheumatoid arthritis, iritis and erythema nodosum. Contraindications are: perforation and peritonitis, abscess and fistula formation, and probably severe malnutrition with marked colon distention. Steroids may be administered to patients with diabetes mellitus or with a history of pulmonary tuberculosis provided the indications are urgent and appropriate supportive therapy is prescribed. Peptic ulcer likewise is not an absolute contraindication. The incidence of peptic ulcer, in our experience, is not excessively high in patients with ulcerative colitis receiving ACTH, hydrocortisone or prednisone. Furthermore, individuals with a previous history of ulcer have taken large amounts of adrenal steroids for long periods without apparent harmful effects. Individual susceptibility seems to be an important determining factor in the development of these complications.

Corticotropin (ACTH), the most potent of the adrenal compounds, is administered usually as the aqueous preparation. Initially it is given in amounts of 30 units per 24 hours, but larger quantities may be prescribed in selected cases. Corticotropin intravenously, 20 units in 500 cc. of 5 per cent glucose in distilled water given every 12 hours, provides the most intense adrenocortical stimulation and may be administered when the response to intramuscular ACTH is inadequate. ACTH gel is prescribed as maintenance therapy, in single daily doses of 40 or 80 units; our experience with this material has not been impressive. Corticotropin-zinc may be given similarly.

The orally administered adrenal steroids, in decreasing order of effectiveness in ulcerative colitis, are: hydrocortisone (200 mg. daily, initially), prednisone (40 to 80 mg.), prednisolone (40 to 80 mg.), and cortisone (300 mg). Hydrocortisone also may be administered intravenously (25 or 50 mg. every 12 hours) and rectally (20 to 40 mg. of the intravenous preparation in 1 or 2 oz. of isotonic saline solution as a retention enema). All other therapeutic measures (rest, sedation, diet, nutritional care and supportive psychotherapy) must be continued. Sulfonamides are prescribed routinely in sufficient quantities for reducing the possible occurrence of purulent complications.

Steroid therapy in ulcerative colitis usually is continued for several months or more, and in some cases for years. The initial doses are lowered gradually, depending on the individual course. When the daily intake of ACTH has reached 30 or 40 units, it may be replaced gradually by hydrocortisone or prednisone orally. The transition is accomplished within several days, on the arbitrary basis of 1 unit of ACTH approximating 1 mg. of prednisone or 2 mg. of hydrocortisone. Maintenance doses of ACTH (20 units), hydrocortisone (40 to 80 units) and prednisone (15 to 30 mg. daily) may be continued for long periods. Discontinuance of the steroids must be very gradual, at times requiring several months; an abrupt recurrence of symptoms may follow premature or excessive reductions in dosage.

Adrenocortical stimulation with ACTH often is recommended after the prolonged use of hydrocortisone and prednisone; we have not observed untoward effects when this procedure is omitted. Ideally, the adrenal steroids are discontinued in ulcerative colitis when the feces are negative for occult blood, bowel function is normal and there is no further proctoscopic evidence of the disease. Roentgenographic evidence of healing is not to be expected until after long periods of improvement—several years or more.

ACTH and the adrenal steroids induce profound metabolic and biochemical changes and are capable of causing numerous complications. The Cushing-like effects include edema, acne, hirsutism, obesity, hypertension, hypo-

kalemia and hypochloremic alkalosis. Hyperglycemia, glycosuria and infections are less frequent problems. Emotional disturbances, chiefly manic and delusional states, develop in 5 to 10 per cent of cases. Discontinuance of the steroids and administration of 100 or 200 mg. chlorpromazine daily result in prompt subsidence of the psychosis. Giant ulceration, perforation of the colon and massive hemorrhage—important complications of ulcerative colitis for many years and now attributed to steroids—have been infrequent in our experience. Excessive friability and "disintegration" of the bowel have been reported in a few patients operated on after lack of response to cortisone; this problem has been very rare in our experience. It is more likely to occur in patients with severe nutritional depletion and pronounced dilatation of the colon; under such circumstances, it has been observed in the absence of adrenal steroid therapy.

The frequency and severity of complications during steroid therapy can be reduced by continued careful clinical and laboratory observation of the patient. Steroids should not be administered in the presence of pronounced nutritional depletion, severe anemia, hypoproteinemia and electrolyte imbalance; hormonal therapy should be deferred until these abnormalities have been corrected.

ACTH and the adrenal steroids do not cure ulcerative colitis or replace established methods of treatment. Most patients respond initially when given sufficient quantities of the hormones. However, recurrences are frequent and subsequent courses of therapy with these agents tend to be less effective, although symptomatic relief usually is obtained. In some cases, prolonged steroid therapy may be the only means of avoiding surgery and maintaining satisfactory health. In general the adrenocortical hormones appear to be helpful adjuncts to conventional treatment when administered properly, serving as "therapeutic bridges" during phases of recurrence or increased severity of the disease. Their use seems to have reduced the mortality rate and increased the proportion of favorable clinical responses. Perhaps more important, the clinical improvement during steroid therapy, although often temporary, has demonstrated the potential reversibility of the disease, renewing hope for its ultimate control.

Surgical Management

Surgical treatment of ulcerative colitis is necessary in cases of extensive fistula formation, stricture with obstruction, perforation, extensive polyposis, recurring massive hemorrhage, and carcinoma, either established or strongly suspected. Operation also may be desirable because of progressive rheumatoid arthritis, portal cirrhosis of the liver, iritis and iridocyclitis, and pyoderma gangraenosum, and perhaps because of marked growth failure in children. Chronic invalidism, often suggested as an additional reason for operation, is not an absolute indication. "Invalidism" must be interpreted carefully; frequently it is a reflection of the medical management rather than the severity of the disease. Excellent improvement has been noted in patients who had previously been advised to undergo operation for this reason.

The recommendation of colectomy for all patients with ulcerative colitis of more than 10 years' duration, because of the hazard of carcinoma, is another difficult problem. The situation may be compared to the increased incidence of gastric carcinoma in patients with pernicious anemia or of colonic cancer in patients with polyps of the rectum and colon; total gastrectomy or total colectomy usually is not recommended under these circumstances. For somewhat similar reasons, it hardly seems advisable to recommend total colectomy in a young woman or man, otherwise in satisfactory health. In the absence of a simple, easily repeated diagnostic test which is without risk to the patient, thorough clinical study of each case would appear to be the most satisfactory solution at present. Careful measurements of fat excretion also are indicated in ulcerative colitis. Steatorrhea is not unusual, especially in right-sided disease or ileocolitis, and operation under these circumstances is especially hazardous.

Total colectomy and ileostomy, in one or two stages, is the operative procedure of choice. Ileostomy alone rarely results in sufficiently

complete healing to permit restoration of normal bowel. Abdominoperineal resection is necessary for a severely diseased rectum. Partial resection of the colon may be undertaken for segmental colitis or for localized areas of polyposis which are the site of recurrent hemorrhage. Subtotal colectomy with anastomosis of the ileum to the rectum may be considered when the rectum is normal. Vagotomy and pelvic neurectomy apparently have not been adopted generally. Appendicostomy no longer is acceptable; cecostomy is performed rarely. Prefrontal lobotomy and electrocoagulation of areas in the prefrontal region of the brain are experimental technics, not to be recommended until much more evidence of their value is available.

Surgical intervention may be very helpful and even lifesaving. Occasionally it is the only method for restoring patients to a satisfactory life. However, operative results are not uniformly successful and it is erroneous to regard surgery as the solution to all the problems of ulcerative colitis. Indeed, in our experience, complications develop in the majority of cases. These include bleeding, prolapse, retraction, fistula formation, perforation and stenosis of the ileostomy, ulceration of the adjacent skin, inability to maintain an ileostomy bag, intestinal obstruction caused by adhesions or adherent loops of small bowel, the development of enteritis (a most disturbing complication), intractable diarrhea with depletion of electrolytes and body water, and emotional problems resulting from inability of the patient to adjust psychologically to the ileostomy. Thus, while some patients are in excellent health after operation, there are many others who require repeated hospitalizations.

Surgical treatment of ulcerative colitis should be undertaken only after the most careful evaluation of the individual case, and it should be considered only when there is a lack of sustained response to comprehensive medical management in the hospital. The decision to operate should not result from frustration with a difficult therapeutic problem, nor should it be determined solely by economic considerations. Time and patience sometimes are the most important ingredients of effective management of this difficult problem. The gratifying response to medical therapy in numerous patients and the occasional transition of the bowel toward normal justify the expectation of greater therapeutic success, with further increase in our knowledge of ulcerative colitis.

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Respiratory Distress in the Newborn Infant

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MORE infants die in the first three days of life than during the other 362 days of the first year. About two-thirds of all deaths during the first year of life occur in the first week.[1] In the past 40 years the mortality rate in Chicago for infants in the first year of life has decreased 10 per cent; the mortality rate for the first month of life has dropped about 2.5 per cent, for the first week about 0.2 per cent, and for the first day of life practically not at all.[2]

Abnormal pulmonary ventilation accounts for more than half the deaths during the first week of life.[3,4] To this mortality we must add the large amount of immediate and ultimate disability due to asphyxia. These facts point up the need of giving the neonatal period our critical attention and stress the importance of continued study of respiratory distress, probably the most common cause of death and disease in this crucial period of life.

Causes of Congenital Atelectasis

Respiratory distress occurs when an inadequate amount of air enters the lungs. In the great majority of cases this is due to persisting inadequate expansion of the lungs—in other words, congenital atelectasis.

Initial atelectasis—Prenatal or natal aspiration may result in initial atelectasis. The normal bellows action of the thoracic cage may be deficient due to lack of normal rigidity or to muscle weakness, or an injury of the central nervous system may result in its failure to supply the proper impulse to the respiratory muscles. External pressure may prevent adequate respiratory excursion or produce secondary collapse of the lung (figure 1).

Secondary or resorption atelectasis—In secondary or resorption atelectasis the lung ex-

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pands and later collapses because obstruction occurs in the airway. The obstruction may be an aspirated foreign substance, a not uncommon occurrence in babies delivered by cesarean section. These infants frequently have an excessive amount of gastric contents at birth, which they may vomit and aspirate. Excess mucus in the upper part of the respiratory tract may be responsible for pulmonary collapse.

Hyaline membrane disease—This is a frequent cause of resorption atelectasis (figure 2). It is seen most commonly in premature infants, those delivered by cesarean section, babies with diabetic mothers, and those who have been exposed to high concentrations of oxygen. Occasionally it is seen following an apparently normal pregnancy and delivery. Clinically, respiratory distress is noted at birth or shortly thereafter and increases rapidly, with increasing respiratory rate, grunting, dyspnea, cyanosis, and sternal and intercostal retractions. The disease progresses for two or three days and spontaneous remission occurs in five to seven days in the 30 per cent of cases in which the infants survive. In the 70 per cent of infants who do not survive, the pathologic findings include dilatation of the left side of the heart, congestion of the lungs with capillary engorgement, resorption atelectasis, pulmonary edema and albuminous fluid in the alveolar ducts.[5] The characteristic finding is a hyalinelike substance coating the lining of the alveoli, effectively preventing air exchange (figure 3).

Opinions as to the etiology of hyaline membrane disease differ widely. The most commonly accepted hypothesis is that the hyalinelike substance is precipitated from amniotic fluid, which is normally present in the alveoli of newborn infants,[6] by a number of agents which are not normally present in the alveoli. These agents include high concentrations of oxygen,[7,8] effusion from pulmonary circulation from any cause,[9] gastric juice from aspirated stomach contents, and probably others. The fluid of pulmonary effusion is probably a frequent precipitating agent. Signs of shock and strain on the left side of the heart are prominent and common clinical and patho-

FIGURE 1. Congenital atelectasis. Note the uniform clouding of the lung fields, the incomplete filling of the thoracic cage by the lungs, and the relatively large heart.

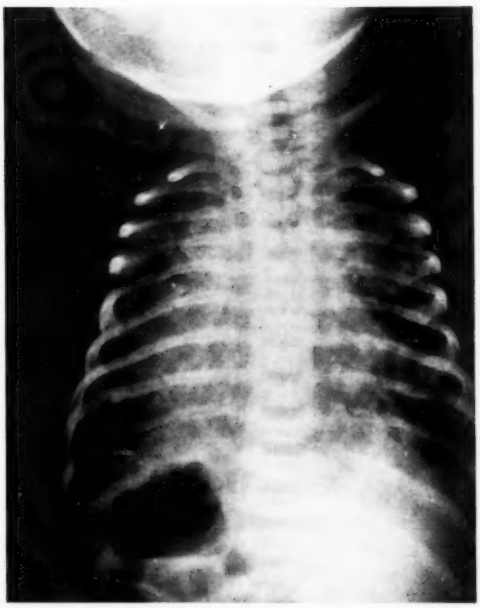

FIGURE 2. Hyaline membrane disease. Note the coarser clouding (not a constant finding).

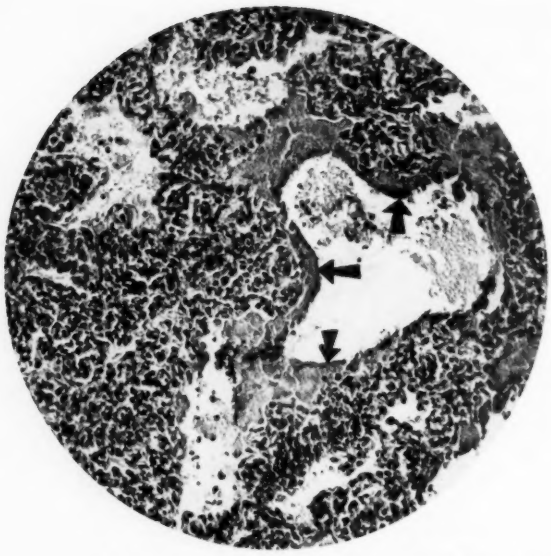

FIGURE 3. Hyaline membrane disease. Hyalinelike substance lines the alveoli. Note also the areas with preponderance of cuboid cells and little elastic tissue (alveolar dysplasia).

logic findings in babies having respiratory distress. As pointed out by Lendrum and others, this syndrome can lead to pulmonary edema with the resulting formation of hyalinelike material by the reaction between the edema fluid and the liquor amnii in the alveoli.

Alveolar dysplasia—Alveolar dysplasia is an embryonic condition in which the lung parenchyma is composed largely of cuboid or low columnar cells with relatively few alveoli. There is little elastic tissue, and vascularization is incomplete. Normally, before the seventh month of pregnancy, or before the fetus weighs 1000 gm., the lungs are not sufficiently developed to maintain extra-uterine life. Precocious development of the alveolar system occasionally occurs before this time, and sometimes the embryonic condition persists beyond the gestational age of seven months, constituting a dysplasia.

Management of Congenital Atelectasis

Provide an open airway. The important fact that 95 per cent of all newborn infants will accomplish the provision of an open airway with very little help is too often forgotten. For most babies showing respiratory distress at birth, we need do no more than hold them up by the feet, gently milk the upper part of the trachea and larynx between thumb and finger, and then gently aspirate from the pharynx the material thus removed from the trachea. Perhaps two or three of every 100 newborn infants will make attempts to breathe without exchange of air. Then, and only then, should one consider use of a tracheal catheter. Only a physician experienced in the technic should perform tracheal catheterization;[10] if an expert is not available the baby's chances of survival are better if he is allowed to dislodge the obstruction by his own efforts than they are if he is subjected to the trauma and shock of inexpert tracheal catheterization.

Most babies born by cesarean section have an excess of amniotic sac contents in their stomachs. Vomiting and aspiration of this material in the first few hours of life are responsible for some instances of resorption atelectasis.[11] It is common practice to aspirate routinely the stomachs of babies born by cesarean section.

Get oxygen into the lungs. It is our job to assist the baby to breathe, not to take over the function of breathing for him. There is a sound basis for this. A good respiratory effort by a newborn infant creates a negative pressure up to 70 cm. of water, which is effective in filling alveoli with air.[12] If we attempt to breathe for the baby by applying positive pressure to the lumen of the trachea, any pressure over 25 cm. can result in emphysema and ruptured alveoli in the proximal areas of the lung, with areas of pressure atelectasis in the more distal portions.[13] Pathologically, this produces the too-common picture of the "Swiss cheese lung" seen at autopsy. *Stimulating* the baby to breathe, rather than trying to breathe for him by means of artificial respiration, should therefore be the first procedure.

How should the baby be stimulated? Whatever method is used, it must be gentle. The Hering-Breuer reflex method[14] is very popu-

lar. It consists of squeezing the baby's chest gently and slowly between the thumb and fingers to the position of expiration, and then suddenly releasing the pressure. Unless the baby is areflexic, this usually results in a reflex contraction of the respiratory muscles and a gasping respiration. Other methods are gentle flicking of the soles of the feet, a *gentle* spank, and digital dilatation of the anal sphincter.

When should the baby be stimulated? The statement has been made repeatedly that failure of the baby to breathe within a minute of birth is an indication for resuscitation.[14] In our experience a literal interpretation of this dictum leads to much unnecessary resuscitation and increased shock. One must first determine whether or not the baby is breathing. Some infants produce an adequate air exchange with barely perceptible respiratory excursion. Nor is mild cyanosis an indication of inadequate respiration. Prenatally the baby lived in an oxygen saturation of about 30 per cent, and in most newborn infants this is evidenced by mild cyanosis. But the ability of fetal hemoglobin to take up oxygen and pass it on to the tissues in the lower ranges of oxygen tension supplies the baby with enough oxygen to avoid tissue anoxia.[15] We may refer to this condition as physiologic cyanosis.

Another special situation in regard to the need for stimulation is an excess amount of oxygen at birth. This occurs when the mother has breathed deeply in the last stages of labor, due to pain or excitement, or when the mother has, quite rightly, been flooded with oxygen in the last few minutes before delivery. The baby is born pink and breathless. Such infants are not asphyxic. They need to build up enough carbon dioxide to stimulate the respiratory center. Resuscitation by stimulation or any other means may simply change a state of physiologic apnea into a pathologic state of shock or stress.

Artificial respiration—Artificial respiration should be reserved for the very small number of infants who do not breathe spontaneously or whose thoracic bellows mechanism cannot be stimulated to function by the measures described. The most direct method of getting air into the lungs is to introduce it under positive pressure. As already stated, a pressure of 25 cm. of water is the highest pressure to which one can safely subject an unexpanded lung, and this is often inadequate to expand it. Day and associates[13] have shown that if the pressure is applied for less than 0.2 second it can safely be increased to 35 or 40 cm. This principle should be observed whether one uses the machine so designed or a face mask with a rebreathing bag. This applies also to the more common but less desirable method of mouth-to-mouth breathing and to breathing into a tracheal catheter. Intermittent pressure can be produced by these latter methods by "puffing" instead of blowing. In any event a check valve limiting the pressure to 25 cm.—or, if intermittent pressure is used, to 40 cm.—should always be a part of the apparatus.

Maintaining Respiration

Oxygen—Oxygen is indicated only if the baby has cyanosis of the extremities, lips or the entire body. A concentration of 40 per cent is adequate, and higher concentrations are known to predispose to hyaline membrane disease.[8] The incidence of retrolental fibroplasia among premature infants increases both when they are exposed to high concentrations of oxygen for short periods and when they are exposed to lower concentrations for longer periods. In fact the probability of development of the disease almost doubles for each two additional days that oxygen is administered to the child.[16]

Liter flow is not an accurate gauge of oxygen concentration. An oxygen analyzer is simple, quick and accurate. Readings should be taken every two hours for adequate control of the oxygen content of the incubator.

Humidity—In spite of Silverman and Anderson's[17] persuasive report, it is still generally believed that an atmosphere of high humidity is beneficial. It minimizes the chances of dehydration and helps prevent secretions of the respiratory tract from becoming thick and tenacious.

Position—The baby's head is kept lowered

if there is much mucus in the nose and throat. Lendrum has suggested that signs of shock or respiratory distress in the presence of a clear airway are evidence of strain on the left side of the heart, which can be lessened by keeping the baby in Fowler's position to allow the excess blood to accumulate below the diaphragm rather than above it; in this way congestion of the thoracic veins and the pulmonary circulation is avoided.

Digitalization—Miller and Conklin[18] divided their series of 96 newborn infants with respiratory distress into three main groups: (1) those whose respirations remained below 60, (2) those whose respiratory rate was high but dropped within a few hours to normal, and (3) those whose respirations increased in the first two days to 60 or more per minute. There were no deaths and little morbidity in the first two groups, but 25 per cent of the babies in the third group died of respiratory distress. On the basis of this work and the work of Lendrum[5] and others,[7] an increasing respiratory rate has been interpreted as evidence of strain on the left side of the heart, and these babies have been digitalized. There have been a few promising reports from this procedure. It seems worthy of further trial.

Body temperature—Recently it has been shown[19] that hypothermia is an oxygen saver in the newborn period and that the infant's body temperature seems to adjust to conform with the available oxygen. We have not seen any ill effects when the infant's body temperature has been 82 to 85° F.

Stimulation—Periodic stimulation sometimes is necessary to maintain respiration in the first 24 hours. To write "periodic stimulation" in the order book is hazardous. Eager attendants often will overstimulate the baby, and there will be danger of shock. Turning the baby from one side to the other every 5 to 10 minutes or *gently* flicking the soles of the feet is almost always adequate for the infant who has a tendency to stop breathing. At present the rocking bed has some advocates in this connection.

Transfusion—It is often forgotten that transfusion is indicated in conditions other than the readily recognized hemolytic disease of the newborn. A frequently unrecognized indication is posthemorrhagic anemia or hematogenic shock.[20,21] The anemia may be due to loss of the infant's blood through the placenta from placenta praevia, abruptio placentae, cesarean section with incision into the placenta, or rupture of umbilical vessels from any cause. Idiopathic bleeding from the placenta is described. The bleeding may be slight and inapparent but it may persist for days or weeks before birth.[21] Diagnosis often is obscure, but the pediatrician will derive much helpful information from a description of the placenta. This description should appear routinely on the record of every newborn infant. Anemia also may follow hemorrhage due to increased capillary fragility often seen in anoxia.

Babies with posthemorrhagic anemia are pale, flaccid and in shock. Respirations are irregular and heart tones are muffled. Their condition deteriorates rapidly in the first few hours after birth, and prompt and active treatment is indicated. Any baby in shock with a history of any of the causes of posthemorrhagic anemia, in whom erythroblastosis has been ruled out, and who has a hemoglobin level of less than 14 gm. should be given 10 to 12 ml. of blood per pound of body weight at once. Simultaneously the shock and hypoxia should be combated with oxygen, heat and high humidity.

Drugs—The only generally accepted drug for stimulating respiration is caffeine sodiobenzoate. It is given in doses of ¼ to ½ gr. intramuscularly or intravenously as often as every 30 minutes. NALLINE® is claimed to be effective in reducing respiratory depression brought on by the action of narcotics of the morphine group. Its mode of action is obscure and results are inconstant. I do not know of any other drug of value to improve respiration in the newborn infant with the possible exception of digitalis, as discussed in the treatment of hyaline membrane disease.

Other Causes of Respiratory Distress

Tension pneumothorax—Probably 5 per cent of cases of abnormal pulmonary ventilation are due to causes other than atelectasis.

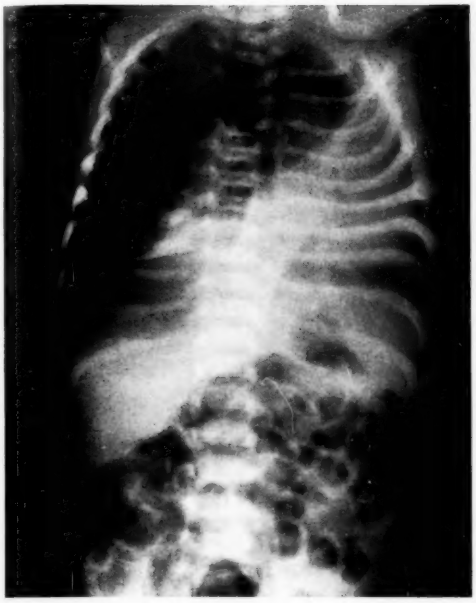

FIGURE 4. Tension pneumothorax. Right lung collapsed. Heart displaced to left. Increasing dyspnea since birth.

FIGURE 5 (same case as figure 4). Tube inserted at 26 hours of age.

Among the most frequently seen conditions in these cases is tension pneumothorax (figures 4, 5 and 6). This condition in the newborn period is usually due to overly strenuous resuscitation. Clinically there is increasing respiratory distress *starting at birth.* Percussion and auscultation usually fail to demonstrate it. A chest x-ray shows the presence of air in the pleural cavity, the collapsed lung and the displaced heart. Prompt insertion of a tube into the pleural cavity is usually effective in relieving the condition.

Congenital lung cysts—True congenital lung cysts probably are all bronchial rests[22] and consist of multilocular cystic cavities lined with epithelium and connected with the bronchial tree. They are usually filled with amniotic fluid or lung secretions before birth. As they are evacuated in the process of aeration of the lung, they gradually fill with air. As the air content increases, the cysts balloon up, crowding out contiguous lung, displacing the heart, depressing the diaphragm, and producing rapidly increasing and extreme dysp-

FIGURE 6 (same case as figures 4 and 5). Appearance after removal of tube at four days of age. Note residual atelectasis. Pneumothorax was due to too-strenuous treatment of the atelectasis.

FIGURE 7. Congenital lung cyst, lower lobe of right lung. Note trabeculation in the cyst. Increasing dyspnea and cyanosis starting at four days of age.

nea and cyanosis. These symptoms usually appear *only after the first few days*, because of the time required for replacement of fluid by air and the complete expansion of the lung. Here again physical findings are not reliable (figure 7). A chest x-ray shows a picture similar to that of tension pneumothorax, with one important difference: Due to their multilocular character, the radiotranslucent areas show faint lung markings. If the diagnosis is clear, prompt lobectomy is indicated (figure 8). If one is unable to distinguish between a congenital cyst and pneumothorax, a needle aspiration or the insertion of a tube with an underwater seal can be done. This will relieve the symptoms of tension pneumothorax with expansion of the lung within 12 to 24 hours but will give only temporary relief if the patient has a congenital lung cyst.[23]

Diaphragmatic hernia—A diaphragmatic hernia may be asymptomatic for an indefinite time or there may be acute symptoms from birth. These may include dyspnea, cyanosis, vomiting and evidence of intestinal obstruction. Physical findings are inconclusive except for one important sign, the presence of peristaltic sounds in the chest. Hearing these sounds is usually a matter of luck or of long-continued, patient listening with the stethoscope. X-ray findings are not necessarily different from those of extra pulmonary air in the chest from any cause. The round radiolucent areas in the lungs which have been described[23] are, unfortunately, often absent. So is an air bubble which crosses the diaphragm. However, these findings are pathognomonic if present. Ingestion of LIPIODOL® (not barium) establishes the diagnosis (figures 9 and 10).

Other causes—Among the rare causes of respiratory distress in the newborn period are pneumatoceles due to prenatal pneumonia, tracheo-esophageal fistulas, duplications of the gastrointestinal tract in the chest connected with the lumen of the esophagus or intestine, and pneumomediastinum.

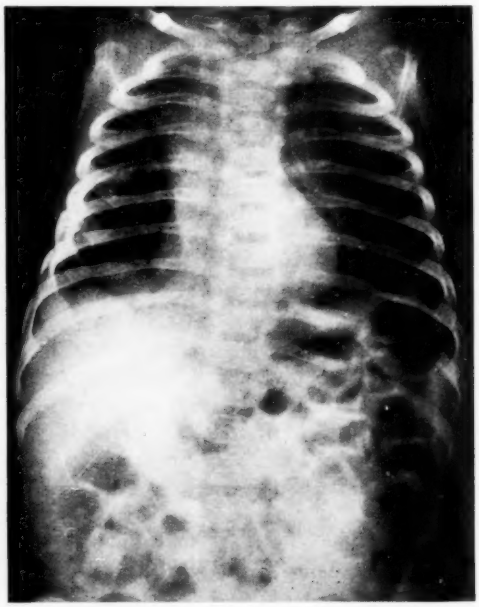

FIGURE 8 (same case as figure 7). Five days after lobectomy for removal of lung cyst.

Roentgenologic Diagnosis

It is obvious that the x-ray plays an important part in the differential diagnosis of respiratory distress in the newborn period. Many factors interfere with its efficient utilization. The x-ray departments of many general hospitals are not familiar with the peculiarities of newborn infants. It is difficult to move the baby in an incubator with its connections for oxygen and water vapor. Many public health regulations for newborn nurseries offer obstacles to getting the babies to the x-ray department. The alternative of using a portable unit rarely yields satisfactory films.

These obstacles are readily overcome. The first essential is a roentgenologist with sufficient training in taking and interpreting the x-rays of newborn infants. A cart is easily devised to hold the incubator, a portable oxygen tank, a simple resuscitation apparatus, and an adequate supply of sterile linen. The baby is moved to the x-ray department by two nursery nurses. A sterile field is established on the x-ray table. The baby is handled only by the nurses under the direction of the roentgenologist. The baby remains in the department until the films are developed and found to be satisfactory. A technic of this type, outlined in detail, probably will have the sanction of the local health departments in communities where health regulations do not permit the temporary removal of babies from the nursery.

X-ray diagnosis is only one area in which cooperation among pediatrician, family physician, obstetrician and roentgenologist pays big dividends. Close contact between the obstetrician and the pediatrician in cases of prenatal disease in the mother alerts the pediatrician to prompt action at the time of the infant's birth. Posthemorrhagic shock, as already discussed, is an example of a condition in which a good prenatal and natal history is of value to the pediatrician. The management of all cases of erythroblastosis by a team composed of an obstetrician, a pediatrician, a hematologist and a patholo-

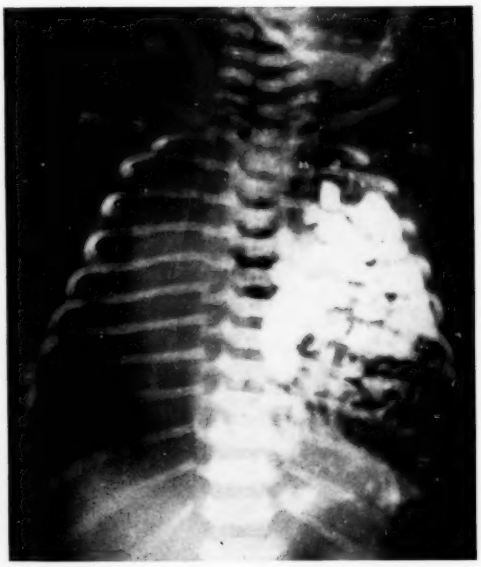

FIGURE 9. Diaphragmatic hernia after ingestion of Lipiodol. Clinical picture similar to that in case of lung cyst illustrated in figures 7 and 8. Bowel sounds heard in left side of chest. Scaphoid abdomen.

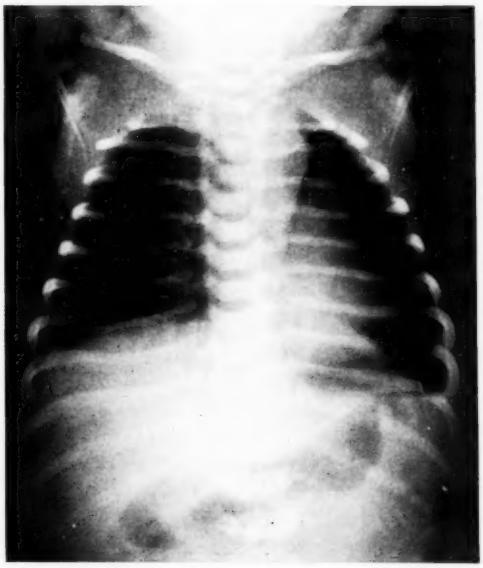

FIGURE 10 (same case as figure 9). Seven days after repair of hernia, illustrating the restoration of normal relationships.

gist, in my experience, has led to a marked drop in the death rate from this disease.

Much of the improvement in the care of infants in the past 10 years can be attributed to the joint action of the various disciplines involved in the care of mothers and infants. The recent very successful first meeting of the Illinois Committee on Maternal Welfare sponsored by the American Committee is an example. A joint committee of the American Academy of Obstetrics and Gynecology, the American Academy of Pediatrics, the American Academy of Anesthesiology, and the American Hospital Association is clarifying some of the problems. Studies of maternal and perinatal deaths sponsored by the American Medical Association are developing some valuable guides.

It is the duty of all of us who work in the area of childbirth to implement this collaborative action at the level of our hospitals and our practices. Only in this way can we bring about a drop in neonatal mortality in keeping with the decrease taking place in other age groups.

Summary

Respiratory distress is the most common single cause of death in the newborn period and by far the most common cause of illness. Its pathogenesis in the large majority of cases is congenital atelectasis, which may be primary (failure of the lung to expand) or secondary (collapse of alveoli after their initial expansion). The three essential principles in management are: (1) Make the avoidance of trauma and shock the primary consideration; (2) be conservative in resuscitative measures; (3) assist the baby to breathe but do not take over the function of respiration. Methods of applying these principles are outlined.

Some of the less common causes of respiratory distress are discussed briefly. The value of the x-ray in differential diagnosis is pointed out, and some suggestions are given for its broader utilization.

A plea is made for continuing and increasing cooperation among obstetrician, family physician, pediatrician and roentgenologist in order to bring about a greater reduction in neonatal mortality.

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Diagnosis of Carcinoma of the Right Colon

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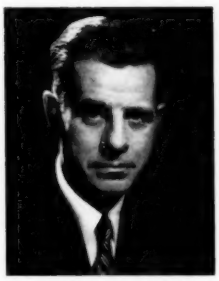

BENTLEY P. COLCOCK

THE five year survival rate following resection of carcinoma of the cecum and ascending colon at the Lahey Clinic is 46 per cent. This is no higher than the survival rate for carcinoma of the transverse, descending or sigmoid colon, yet a cancer of the cecum or ascending colon can be removed along with 12 in. or more of bowel on either side of the lesion plus all of the mesentery to the right half of the colon. It is not uncommon for a carcinoma of the right colon to reach such a size that it is easily palpable through the abdominal wall and still be completely limited to the bowel and adjacent mesentery. A lesion of similar size in the left colon is usually associated with liver metastasis. A carcinoma of the right colon may be associated with marked anemia and still be curable by surgical resection. A similar degree of anemia in a patient with carcinoma of the left colon usually indicates far-advanced malignant disease. It would seem that the prognosis for patients with carcinoma of the cecum and ascending colon should be better than it is.

At the clinic all patients with carcinoma of the cecum or ascending colon are submitted to laparotomy, and the lesion is resected in over 90 per cent. If extensive liver metastases are present the lesion is bypassed by anastomosis of the terminal ileum to the transverse colon. Of the 24 patients who had resection for carcinoma of the right colon in 1953, 2 died. One patient died from cirrhosis and the other from myocardial infarction; they were 68 and 70 years of age.[1]

Recent refinements in technic may save a few additional patients. Preliminary ligation of the blood vessels will prevent blood-borne metastases resulting from manipulation of the tumor during the operative procedure. Preliminary isolation of the tumor by ligation of the bowel on either side may prevent a local recurrence due to implantation of tumor cells

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in the line of anastomosis. It is obvious, however, that for any significant improvement in the five year survival rate for patients with carcinoma of the cecum and ascending colon one must return to the problem of earlier diagnosis. The longer the interval between the origin of the carcinoma and its surgical removal, the greater the opportunity for extension of the malignant process and the less opportunity for a cure. This is true despite the fact that an individual patient with cancer of the colon may show liver metastases even though his lesion is small or "early" and his symptoms have been of short duration. Fortunately the converse also occurs and many patients with carcinoma of the colon, particularly the right colon, will have large growths with symptoms for many months and still show no sign of metastasis.

In spite of the publicity given to cancer in recent years, little progress has been made in decreasing the time interval between onset of symptoms and the diagnosis of malignancy in patients with cancer of the colon and rectum.[2,3] Until this can be done, we cannot expect a marked improvement in the five year survival rate. If it were possible to submit everyone over 45 years of age to a periodic physical examination, including a complete gastrointestinal study, this interval would decrease. This program is practical only on a limited scale at present.

There is, however, one aspect of the problem about which we can do something—the delay in the establishment of the diagnosis after the patient first consults a physician. A significant delay in diagnosis after the patient first consulted a physician occurred in 28 per cent of the patients with carcinoma of the colon and rectum seen at the clinic during 1953. For those patients with carcinoma of the cecum it was 50 per cent.

TABLE 1

INITIAL SYMPTOMS IN 80 PATIENTS WITH CARCINOMA OF THE RIGHT COLON

	NUMBER	PER CENT
Pain or discomfort	36	45.0
Weakness, fatigue, pallor, anorexia and loss of weight	35	43.8
Constipation or diarrhea	9	11.2
TOTAL	80	100.0

In an effort to determine the factors responsible for this delay, the records of 80 consecutive patients with cancer of the cecum and ascending colon have been reviewed. These patients were seen at the clinic between 1951 and 1956.

Age and Sex

The majority of patients were from 50 to 80 years of age. The oldest was 86 and the youngest was 30. Only three patients were under 45 years of age. There were 41 men and 39 women.

Symptoms and Signs

Pain—Abdominal pain in its broadest sense was the commonest single symptom in this group of patients (table 1). It was the initial symptom in 36 (45 per cent). This pain was usually referred to the right side of the abdomen although it may extend across the lower or even the upper portion of the abdomen. In its early stages the pain was a vague, mild discomfort variously described as flatulence, bloating and often, by women, as a bearing-down sensation. *Rarely was the pain constant or steadily progressive. For weeks and sometimes months it was intermittent or transient.* It was frequently relieved by lying down or by a bowel movement. Eventually some degree of abdominal discomfort developed in all of these cases.

Weakness and fatigue—Weakness and fatigue were the initial symptoms in 21 patients (26.2 per cent). The men frequently described this weakness as being most marked in the legs. This unexplained chronic fatigue was often present for weeks or even months before other symptoms came to the attention of the patient. Many times it was the only symptom which was present when the patient first consulted a physician.

Pallor—Five patients consulted their doctor because they had noticed unusual pallor. Pallor was a common finding on physical exami-

nation and 19 patients (23.8 per cent) were found to have a hemoglobin level of 10 gm. or less. This anemia was not associated with a history of significant blood loss. Even in the small group of patients with blood in their stools, the frequency and degree of the bleeding were inadequate to account for the severity of the anemia. It was a hypochromic anemia and persisted despite therapy.

Anorexia and weight loss—Anorexia and weight loss were the first symptoms noticed by nine patients. The weight loss was as much as 20 to 30 lb. and was often associated with a noticeable decrease in appetite.

Thus, in 35 patients or 43.8 per cent of the entire group the initial symptoms of carcinoma of the right colon were weakness, fatigue, pallor and loss of weight—symptoms that would appear to be unrelated to the gastrointestinal tract or even to the abdomen.

Constipation and diarrhea—Fifteen patients complained of constipation, a symptom often ignored by patient and physician alike. In seven patients constipation had been the initial symptom. Seven had diarrhea associated with intermittent abdominal pain and in two cases it was the first symptom. Four patients had alternating constipation and diarrhea. This actually consisted of an increasing constipation occasionally relieved by several liquid stools. In a few cases the constipation was rapidly progressive but in most it was a gradually increasing affair extending over weeks or months. *The majority of the patients with carcinoma of the right colon did not have a change in bowel habit.*

Bleeding—Fifteen patients had noticed blood in their stools. In only one case was it an early symptom. Unlike bleeding from the hemorrhoidal area, the blood was mixed with the stool. Eight patients had stools described as dark red, and seven as very dark or black. Several patients had been reassured by their physicians that the black stools were due to the iron they were receiving.

Vomiting and abdominal distention—Vomiting is an unusual symptom in carcinoma of the right colon and was present in only seven cases. When present, it was associated with extensive intraperitoneal spread of the tumor. The same is true of abdominal distention, which was present in only three cases.

Abdominal mass—An abdominal mass was palpable in 38 cases (47.5 per cent). Usually in the right lower quadrant, it may be opposite or slightly above the umbilicus. In two instances it had been found by the patients and was the reason they had consulted a physician. Frequently the mass was felt on more careful palpation of the abdomen after it had been missed by the first examiner. Many patients in whom an abdominal mass was not palpable were obese or overweight. In two cases the carcinoma was found on routine abdominal exploration at the time of laparotomy for other conditions.

Duration of Symptoms

Twenty patients or 25 per cent had had symptoms for a year or longer before the diagnosis was established. Thirty-two or 40 per cent had had symptoms for 6 to 12 months. Fourteen had had symptoms for six weeks to six months. *Thus, at present, 65 per cent of the patients whom we see with carcinoma of the right colon have had symptoms for six months or more.* Swinton and Counts[3] found that the interval between onset of symptoms and definitive surgical treatment averaged seven months for 901 patients operated on at the clinic for carcinoma of the colon and rectum. Schutt and Walder[4] found an average duration of symptoms before diagnosis in patients with carcinoma of the right colon of 10 months.

Medical Delay in Diagnosis

In this group of patients the physician was found to have been responsible for a delay in diagnosis in 55, or 68.7 per cent (table 2). A delay in diagnosis on the part of the physician was considered to have occurred if six weeks or more had elapsed between the time the patient was placed on some form of therapy and the time the correct diagnosis was established. Lest this criterion appear too severe, I should point out that only in a few instances was the interval as short as six weeks. Most of these patients had had two to three months of treatment and an occasional patient

had been under the care of a physician for eight months or more. In many instances this interval might have been longer had not the patient decided to seek other medical advice.

The various conditions for which these 55 patients were being treated are of interest. Eighteen were treated for anemia, usually with iron and vitamin B_{12}. Several had received transfusions without any further attempt to determine the cause of the anemia. The diagnosis was diverticulitis in three cases, duodenal ulcer in three, gallbladder disease in four and colitis in three. In three the persistent weakness was said to be due to a "virus attack." Two patients were being treated for heart disease, and one patient with costovertebral pain had been under the care of a chiropractor for weeks. In many instances a specific diagnosis had not been made. In fact, six patients recently had been hospitalized and discharged without a diagnosis. Six patients had recently undergone operation but the carcinoma had not been discovered; two had had subtotal gastrectomy, one cholecystectomy, and one prostatectomy. One patient had had appendectomy. In this case the surgeon thought the "inflammation" was in the cecum rather than in the appendix and a biopsy of the cecum had been taken. Unfortunately the biopsy specimen was lost and the diagnosis of carcinoma of the cecum was not made until two months later. The sixth patient had had a rectal polyp removed.

Barium Enema Examination

In 35 patients or 43.7 per cent of the entire group, failure to make the correct diagnosis was directly due to the fact that a barium enema study was not carried out. This serious error in judgment was accentuated in seven cases in which the patients had been submitted to an upper gastrointestinal study alone. In another eight cases a barium enema study was carried out but the results were interpreted as normal. Perhaps the most tragic of all was the group of five patients in whom the original barium enema was reported as showing a questionable lesion of the right colon but the examination was not repeated and the carcinoma was not discovered until months later. The barium enema was eventually repeated when symptoms persisted or when a mass was discovered in the right side of the abdomen.

TABLE 2

CARCINOMA OF THE COLON IN 80 PATIENTS

	NUMBER	PER CENT
Medical delay (six weeks or more)	55	68.7
Reason:		
Barium enema not done	35	43.7
Upper gastrointestinal study only	7	8.7
Barium enema considered normal	8	10.0
Barium enema questionably normal but not repeated	5	6.2

There were eight patients whose initial diagnostic study was carried out at the clinic and in whom the barium enema examination was interpreted as showing questionable pathologic change in the right colon. Laparotomy was advised in two cases because carcinoma could not be excluded from the appearance of the barium enema film. One patient was operated on because a mass was felt in the right side of his abdomen. In another case the carcinoma was discovered on the lateral roentgenogram (figure 1a and b). In three cases the barium enema study was repeated two weeks later, at which time the diagnosis of carcinoma of the right colon was established. The eighth patient had had a duodenal ulcer and had returned for a routine checkup. The upper gastrointestinal study showed a deformed duodenal cap, and a "possible" filling defect was noted in the right colon on barium enema examination. The patient was asymptomatic and the film was finally interpreted as normal. Unfortunately it was not repeated until the patient returned four months later because of abdominal distress. At that time a barium enema study revealed a carcinoma of the cecum.

The seriousness of delay in the diagnosis of this disease is shown by the fact that at the time of operation 11 patients in this group had liver metastases, six had peritoneal metas-

tases, 21 had lymph node metastases, and nine had blood vessel invasion.

Four patients had previously had resection of the colon or rectum for carcinoma. All patients with malignant disease of the large bowel or rectum should have follow-up examinations as long as they live. In seven cases there were associated mucosal polyps in the resected specimen.

Physician Patients

The ease with which the early symptoms of carcinoma of the right colon may be overlooked is well illustrated by the clinical records of the seven physician patients in the group. Dr. A treated himself for weakness and pallor for over six weeks before he had a barium enema examination. At operation it was found that the carcinoma of the cecum was associated with lymph node and blood vessel invasion. Dr. B had noticed chronic fatigue for two and one-half months associated with an intermittent change in bowel habit. He had a palpable abdominal mass on examination and at operation was found to have a large carcinoma of the cecum. Dr. C's weakness and faintness for three months had been diagnosed as a mild cerebrovascular accident until a cardiologist felt a mass in the right side of the abdomen. Dr. D had had intermittent pain from "gallstones" for years and persistent upper abdominal distress for five weeks before a barium enema examination was done and a carcinoma of the cecum was discovered. Dr. E had been treated for two years for diverticulitis. After six months of dull, intermittent abdominal pain and four weeks of severe abdominal pain a barium enema study was done which revealed a carcinoma of the ascending colon. Lymph node metastases and blood vessel invasion were present in the resected specimen. Dr. F, a young surgeon just completing his training, had had abdominal cramps for six months and rectal bleeding for two months before a barium enema study established the diagnosis of carcinoma of the right colon. He survived less than one year following resection. Dr. G, a nationally known surgeon, had had abdominal distress with occasional liquid stools for five months before a barium enema

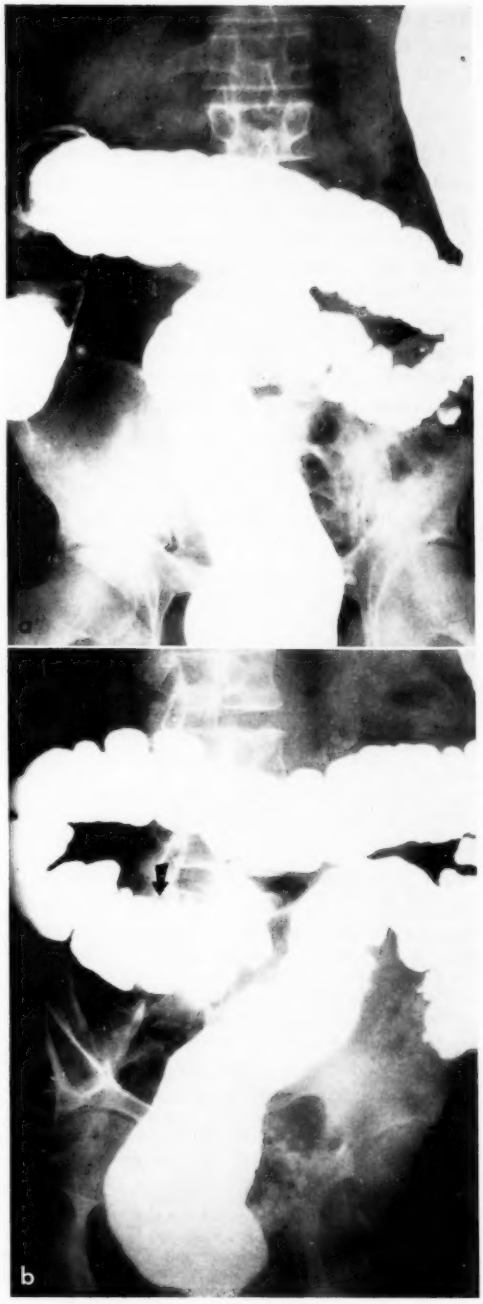

FIGURE 1a *(top)*. The anteroposterior barium enema film appears normal. b *(bottom)*. The lateral film of same patient reveals a large filling defect in the cecum due to carcinoma.

study was carried out. At operation he had a large carcinoma of the cecum and survived less than a year after resection.

Summary and Conclusions

Fifty-five (68.7 per cent) of 80 patients with carcinoma of the cecum or ascending colon were treated for six weeks or more before the correct diagnosis was made. Thirty-five of the 55 patients did not have a barium enema examination as a part of their initial diagnostic study. Seven had had an upper gastrointestinal study but no barium enema. In eight cases the barium enema films were read as normal and were not repeated. In five the barium enema study showed questionable pathologic change in the right colon but the study was not repeated. A carcinoma of the cecum may be revealed only in the lateral roentgenogram.

How easily the diagnosis may be missed is indicated by the fact that 43.8 per cent of this group did not have abdominal symptoms in the early stage of the disease. Their symptoms were weakness, fatigue, pallor, anorexia and loss of weight. Abdominal distress was the initial symptom in 36 or 45 per cent. It was usually mild and often intermittent for weeks or months. In only 8.7 per cent was the first symptom directly referable to the gastrointestinal tract, and this was the common complaint of constipation.

There is a needless delay in making a diagnosis in many patients with carcinoma of the cecum or ascending colon. This is due to the use of "symptomatic" or "expectant" treatment without adequate diagnostic study. A barium enema examination should be carried out in any patient with unexplained weakness, pallor or recurrent abdominal distress.

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MEETINGS *and Postgraduate Courses*

International Conference of Ultrasonics in Medicine, Los Angeles: September 6 and 7, at the Statler Hotel. Sponsored by the American Institute of Ultrasonics in Medicine. For further information, write to: Dr. John H. Aldes, Secretary, 4833 Fountain Avenue, Los Angeles 29.

National Society for Crippled Children and Adults, Chicago: Annual convention, October 31 to November 2, at the Palmer House. For further information, write to: Catharine Bauer, Director of Information, The National Society for Crippled Children and Adults, 11 South LaSalle Street, Chicago 3.

New York University Post-Graduate Medical School, New York: A one week course covering the field of compensation medicine, October 21 to 25. To be presented in 10 sessions, this course is offered in connection with the American Academy of Compensation Medicine. For further information, write to: Associate Dean, New York University Post-Graduate Medical School, 550 First Avenue, New York 16.

Stanford University School of Medicine, San Francisco: Postgraduate conference in office dermatology, September 19 to 21. For further information, write to: Office of the Dean, Stanford University School of Medicine, 2398 Sacramento Street, San Francisco 15.

The World Medical Association, Istanbul, Turkey: Eleventh general assembly, September 29 to October 5. For further information, write to: Dr. Louis H. Bauer, Secretary General, The World Medical Association, 10 Columbus Circle, New York 19.

University of Southern California School of Medicine, Postgraduate Division, Los Angeles: Yearlong basic science course in dermatology, beginning September 16, at the Los Angeles County Hospital. Dr. Maximilian E. Obermayer will direct the course. For further information, write to: Dr. Phil R. Manning, Director, Postgraduate Division, University of Southern California School of Medicine, 2025 Zonal Avenue, Los Angeles 33.

The Treatment of Open Injuries to the Hand With Particular Reference to Tendon Repair

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IT is seldom necessary nowadays to emphasize to a group of physicians the importance of injuries to the hand, and I believe that the laity likewise is beginning to appreciate the necessity of early and good care of even small wounds of the hand.

MICHAEL L. MASON

When we see a patient with a hand injury and there is damage to a tendon, we face the decision as to whether we should repair the tendon primarily or secondarily. This decision sometimes is very difficult, particularly in cases of small wounds. For example, one does not like to tell a patient, after operating to close a small laceration on a finger, that the tendon was divided but the circumstances of the wound were such that suture of the tendon was not indicated. Yet, if we disregard some of these teachings and suture the injured tendon when such a repair is not indicated, both the surgeon and the patient come to grief; when the wound is opened again for repair, it is more difficult to manage, and the patient must undergo a second operation anyway.

We should not feel that we must repair an injured tendon immediately. Our job initially is to secure healing of the wound by primary intention with the tissues soft. If the tendon can be repaired initially, that is fine; if it cannot, we should simply inform the patient that it can be done when the tissues are soft, the joints are mobile, and conditions are more suitable.

Discussion of Representative Cases

There are three patients here today whose cases illustrate various aspects of the problem of tendon repair in hand injuries. The first patient had damage to the flexor tendons in two digits, and immediate repair was carried out. The second had secondary suture of a

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flexor tendon in one finger. In the case of the third patient, tendon repair has not yet been done; secondary suture of the tendons is not possible in this instance, and grafting will be necessary.

Immediate repair of flexor tendons—The first patient was injured about six weeks ago in a holdup. He defended himself with his left hand, and the robber's knife cut across the volar surfaces of the left index and middle fingers. The cuts were relatively clean. He went to the hospital immediately, and within two hours he was in the operating room. The flexor tendons were repaired by exposing them in the fingers, by exposing the proximal stumps of the profundus tendons in the palms, by threading the deep tendons through the fingers up to the sites of injury, and by suturing only the profundus tendon in each finger. The sublimis tendons were removed. The hand was then splinted to keep the tendons and the wrist relaxed in flexion until the tendons healed. The sutures were removed three weeks later, and a day or two after that the patient was started on physical therapy.

Already he is beginning to regain some flexion of the fingers, only about a month and a half later. He has good flexion of the proximal joints of both digits, and there is some flexion of the distal joint of the middle finger and perhaps a little in the distal joint of the index finger. The tissues are still hard, because tendons heal like bone—by formation of a callus. They heal by getting their blood supply from the surrounding tissue, and therefore a healed tendon is, to some extent, stuck to the surrounding tissue.

It will take a little time for this man to regain motion of the two injured fingers, but it has started and I have no doubt that function will return. Whether or not he will have complete flexion of the distal joints, of course, only time will tell, but motion has started and that is encouraging.

An important point in the after-treatment of these patients is the exercising of the muscles. This man has had a certain amount of physical therapy, but from now on it is his job to get his hand and fingers in moving order. I usually tell my patients to spend four or five minutes, four or five times a day, with their hand in a basin of warm soapy water—not just soaking the hand but washing the two hands together and exercising the fingers. The action of the small muscles in the hand, of course, is the force that pumps the blood up into the forearm, and that is very important. We also tell these patients that in exercising the hand they should not merely wiggle the fingers in the air but should clench the hand and make the forearm muscles tight—close it as if they were making a fist, and feel the flexor muscles. If they do not bring them down tight, tell them to clench harder, to make the muscles work. Muscles atrophy immediately following injury, and to restore function one must actually force their use. Wiggling the fingers will not help.

Secondary suture of a flexor tendon—The second patient's story is interesting because I do not believe there is complete agreement on the treatment that was given. The end result is excellent. Some two years ago, while fixing a fender in a shop, this man's little finger was lacerated. Only the flexor profundus tendon was divided; the sublimis was not damaged. He was able to bend the proximal joint but not the distal joint or tip.

The question of what to do in a case such as this is a difficult one. Should we simply assume that the patient has fairly good motion and not repair the deep tendon? Should we attempt to repair the deep tendon? Should we fix the joint? Some surgeons advocate fixing the distal joint in slight flexion by means of a fine pin inserted through the joint, or suturing the end of the profundus tendon to the front of the bone—i.e., a tenodesis to hold the joint in moderate flexion.

I feel, as did the surgeon in this case, that it is desirable to regain even a modicum of active motion in the distal joint, even if it is just a little finger. This patient is only 22 years old, and he has to use that finger for another 50 years or so.

Fortunately, in this type of injury the proximal stump of the profundus does not always retract up into the palm. Frequently it retracts only to the region of the proximal interphalangeal joint. I do not know if that is what the

surgeon found in this instance, but a little less than four weeks after the injury the patient underwent an operation and the tendon was sutured. The profundus tendon was sutured at the distal interphalangeal joint, and the intact sublimis tendon was not touched. About four months after that operation, the finger was still stiff, and the surgeon then did a tenolysis and put in some hydrocortisone. I do not know whether the hydrocortisone helped or not, but certainly the tenolysis did, because immediately afterward the patient was able to flex the finger. Now, I do not believe you could tell that the profundus tendon had been divided. That really is an excellent result, and to my mind it represents a better solution to this type of injury than fixation of the joint in flexion by either a pin or a tenodesis.

Secondary repair of both tendons of middle finger—The third patient injured his hand when he slipped and fell while helping his brother put a television antenna on the roof. As he started to slide down, he grabbed the gutter, and his middle finger was lacerated across the region of the proximal interphalangeal joint. It was quite a deep cut, and it was not a clean one, of course. Consequently, the surgeon simply cleaned it out and closed the wound, realizing that tendons were divided. That was a couple of weeks ago. The wound is now healing, and in a few weeks the finger will be reopened and tendon repair done.

The patient has a little active flexion of the proximal interphalangeal joint of the injured finger; he does not know how much, because the finger is splinted. We cannot be sure that the sublimis tendon is or is not intact, because frequently we see a little motion in the proximal joint even with both tendons divided. If we exert some pressure against the finger we often find that the patient cannot flex the joint against resistance. There also is some loss of sensation along the ulnar side of the finger, and the digital nerve will be sutured when the tendon is repaired. These are very important nerves to repair. Two or three stitches of fine nerve silk will bring the ends together. These little nerves regenerate with remarkable rapidity; sometimes in three or four weeks after repair, sensation begins to return to the finger tips.

When should tendon repair be undertaken in this case? How soon after this injury is it wise to reopen the finger, and how should we repair the tendons? First of all, we must wait until the wound is completely healed and until the tissues are soft. We must be sure that the joints are mobile. If there is any infection (there is none in this case), we must wait a little longer.

We like to open the finger through a hockey stick-shaped incision along the lateral side—the so-called mid-lateral incision which skirts the ends of the flexion creases; it must lie back of the ends of the flexion creases to expose the whole of the volar surface of the finger. The proximal ends of the tendons are exposed in the palms, either through a transverse incision or through an incision following the thenar flexion crease.

Secondary suture of the tendons practically never is possible in an injury of this type in this area. You will recall that in the case of the second patient the division was distal to the sublimis insertion and secondary suture was possible. In injuries involving both tendons a tendon graft is necessary.

As the source of graft, we use one of two tendons, either the palmaris longus if it is present (usually we ask the patient to flex his wrist hard forward, and see if we can feel the palmaris longus) or one of the long extensors of the toes. A segment of tendon is removed along with some of the surrounding paratenon. This graft is inserted from the palm through the finger and attached to the distal phalanx. We remove the remnants of the other tendons, but we like to leave a short segment of the distal stump of the sublimis intact. The sublimis has two slips that insert on either side of the middle phalanx. If we excise the sublimis right at its insertion, the proximal interphalangeal joint is likely to hyperextend. Therefore, we leave enough of the sublimis tendon intact to subtend the volar surface of the joint and minimize the tendency to hyperextension. We must also leave two vaginal bands of the fibrous sheath across the tendon, one over the middle phalanx and the other

over the proximal phalanx, so that when the finger is flexed the tendon does not bowstring forward on the anterior surface of the finger.

PATIENT: May I ask a question? I am not a physician and I don't know anything about the bone structure of the hand, but at this joint is there a tunnel of some sort that the tendon goes through to protect it in normal use? And, if so, since this is cut right through that tunnel, or very close to it, would there be any kind of a knot or swelling at this point where the tendon is put together to keep it from sliding properly back through here?

DR. MASON: That is a good question. The patient wants to know if, when the tendon is repaired, he is going to have a knot that sticks in the tunnel and interferes with motion. That is exactly what the situation would be if suture were carried out at that point. Of course, what will be done is that the old tendon will be taken out and a tendon graft will be threaded through the finger; it will be a completely new tendon with a smooth surface and no knot on it at all.

Principles of Treatment

In any discussion of treatment of open injuries of the hand, we must consider both the general care of open wounds and the functional restoration of the hand. It is not enough to secure healing of the wound without infection. The hand must be restored to greatest possible function commensurate with the injury. It is this reason that impels anyone discussing this subject to stress careful "atraumatic" technic. Satisfactory results following the surgical procedures on the hand require reactionless healing.

It hardly seems necessary to call attention to the economic and practical importance of the hand. It is difficult to assess its value accurately, however, even though we often are called on to do so by insurance companies and disability boards. A strictly mathematical computation based on loss of parts, percentage of loss of motion, and sensory loss may not express at all the disability which the patient suffers. The actual functional loss which a concert violinist sustains from anesthesia of a small area on the tip of the left little finger may be 100 per cent, while a comparable injury to the hand of a laborer, or even a surgeon, would cause little or no functional disturbance. But one must not underestimate the great value to a patient of even a little sensation and a minimum of motion. The finest prosthesis can furnish a mechanical grasp and pinch, but no prosthesis known can restore feeling. Hence, in care of an injured hand, no effort is spared to save any part which may be functionally valuable.

The initial operation following injury is by far the most important; it determines the fate of the hand. That does not mean that one must accomplish complete anatomic restoration initially. It does mean, however, that the wound must be properly cleansed, excised and closed. It is essential to secure primary closure, and it is also essential not to do any more at this or any other time than the condition of the tissues permits.

When the patient is first seen, the wound should be covered with a voluminous sterile dressing, the hand splinted, and the patient sent at once to a place where definitive treatment can be accomplished. There, after securing a history and evaluating the extent of damage, surgical care is instituted. This consists of careful cleansing with soap and water, followed by wound excision and then whatever reparative measures are admissible.

General anesthesia is necessary for the surgical care of wounds of any extent, and certainly in cases of wounds with nerve and tendon damage. In some clinics, brachial plexus block is used. A bloodless field is necessary for satisfactory repair; this is secured by means of a sphygmomanometer cuff pumped up to 280 mm. Hg.

Criteria for Primary Tendon Repair

The problem of primary tendon repair comes into consideration especially in cases of clean lacerated or incised wounds. Very rarely, indeed, may tendons be repaired primarily in crushing injuries, and then it is only the extensor tendons which occasionally may be repaired. Usually, a crushing or an avulsing injury is an indication for simply cleansing and excising the wound, closing it by what-

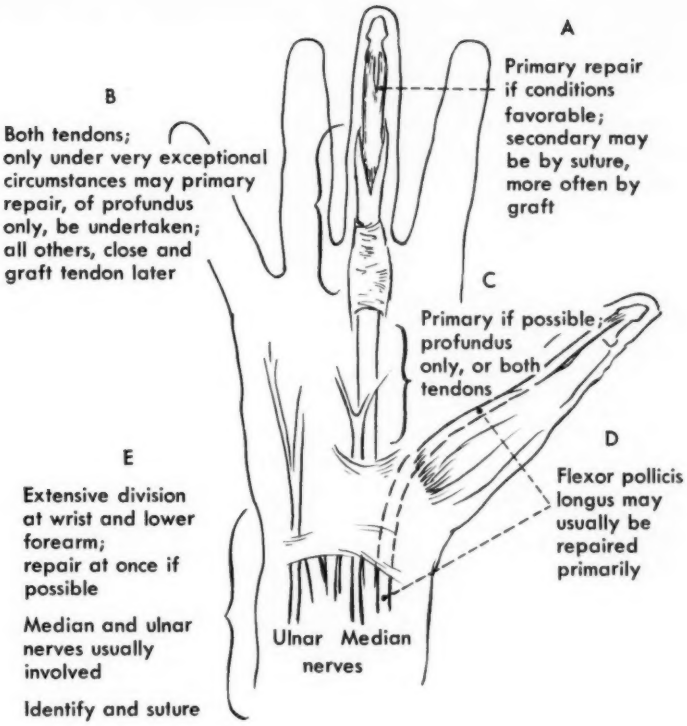
A
Primary repair if conditions favorable; secondary may be by suture, more often by graft
B
Both tendons; only under very exceptional circumstances may primary repair, of profundus only, be undertaken; all others, close and graft tendon later
C
Primary if possible; profundus only, or both tendons
D
Flexor pollicis longus may usually be repaired primarily
E
Extensive division at wrist and lower forearm; repair at once if possible
Median and ulnar nerves usually involved
Identify and suture
Ulnar Median nerves

FIGURE 1. The indications for immediate repair of the flexor tendons of the hand must be strictly preserved, not only as to location but also as to time, degree of contamination, facilities for repair, and skill of the operator.

ever means are necessary, and planning secondary functional restoration later, often in several stages.

In a case of a reasonably clean lacerated or incised wound with tendon division, there are various criteria which determine whether or not primary tendon repair is justified, indicated or permissible. The length of time which has elapsed since injury is of some importance. Ordinarily, primary repair of the flexor tendons is seldom undertaken when the patients are first seen more than six hours after the injury, although under very favorable circumstances we might list eight hours as the upper limit. We do not hold with some surgeons that the antibiotics have raised these upper limits appreciably—even to as much as 12 hours. Only very rarely do we feel that tendons should be sutured in wounds more than six hours old, and then only the extensor tendons and in some instances the flexor tendons in the lower forearm or palm.

The time limit for repair of divided flexor tendons within the digital sheath is even more strict. Here, two hours seems a proper upper limit, and then only if all other conditions are satisfactory.

The nature of the wounding agent is likewise important. One must assume that contamination with virulent, invasive organisms has occurred in instances of injury with a badly contaminated object—e.g., wounds from teeth, plumbing or sewage fixtures, or an autopsy knife.

We must also consider the treatment which the patient received previously. One is justified in assuming that invasive contaminants are present if the wound was not covered promptly; if it was subjected to examination under careless conditions; or if probing or

abortive attempts at operation were carried out. Under such circumstances one should not do tendon repair immediately. The wound should be cleansed, excised and closed.

A drunken patient is not a good operative risk, and tendon repair in such a case would require several hours of anesthesia, which is not advisable.

The surgeon requires an assistant and an anesthetist for any type of tendon repair except possibly a divided extensor tendon. Therefore, unless he has adequate help, it is unwise to attempt to repair an injured tendon; he should simply close the wound and plan to do repair later.

It seems needless to remark that the surgeon should have the proper instruments, needles, sutures, and so on. Tendon surgery on the hand is no surgery for the amateur. Unless the operator has had some experience in this field or is closely supervised by an experienced surgeon, it is better that he leave the tendons alone and simply close the wound. One cannot stress this point too strongly. Even in expert hands the repair of tendons, especially the flexor tendons, is fraught with much uncertainty.

The location of the injury and the tendons involved are of significance. In general, the extensor tendons may be repaired with a fair assurance of success up to the limit of eight hours after the injury. This applies particularly to tendon division in the dorsal digital area and dorsum of the metacarpus, since these segments of the common and proper extensors are not enclosed in a synovial sheath but by paratenon. Retraction is much less marked and healing is more certain.

It is helpful to remember that the paratenon-covered extensor tendons often will heal spontaneously if the wrist and involved digits are kept relaxed by proper splinting. This may not be the best method of repair, but when the time limit has been exceeded it is comforting to know that all is not lost.

The indications for repair of the flexor tendons are somewhat more rigid than those for repair of extensor tendons. This is largely because the flexors are sheath-enclosed throughout most of their course in the wrist, palm and digits, and in the digits they run in rigid channels which prevent swelling and to which the healing tendons may become firmly adherent. Reactions about these sheath-enclosed tendons tend to run the whole length of the sheath, so that it is not unusual to find adhesions extending from the palm to the distal insertion even when smooth healing apparently has taken place.

It is in the flexor sheaths on the volar surface of the digits that the most difficulty arises, and here agreement is not uniform as to the proper course to follow.

Indications for and contraindications to repair vary with the anatomic site of the tendon division. In a case of division of the profundus tendon distal to the sublimis insertion, primary suture may be carried out, all other things being equal. The suture line should lie close to the joint so as not to impinge on the pulley over the middle phalanx.

If only the profundus is divided, at or proximal to the insertion of the sublimis tendon, it seems unwise to attempt primary repair, since the suture line is almost certain to become adherent to the sublimis tendon. In this case the wound is cleansed and closed. After healing has occurred and reaction has subsided, one may attempt functional restoration by means of a tendon graft which passes through the fork of the uninvolved sublimis.

If both the profundus and sublimis tendons have been divided in the digital sheath, primary repair occasionally may be done if the conditions of the wound are satisfactory, i.e., if the patient is seen early after the injury and the wound was not tampered with. The surgeon who undertakes this repair should have had experience in tendon surgery, should have proper instruments and assistance, and should understand the after-treatment. With a very careful technic, correct exposure and a minimum of suture material, it is often possible to secure a satisfactory result. Only the profundus tendon is sutured; the sublimis tendon is removed. It is a good practice to leave enough of the distal stump of the sublimis tendon to subtend the proximal interphalangeal joint, since this tends to prevent subsequent hyperextension of the joint. Actually, the very strict

indications for tendon repair at this particular area are not often met; however, under the proper conditions, primary repair may be successful.

Repair of the flexor pollicis longus tendon may be carried out primarily regardless of location of the injury, providing other conditions are met. This single tendon heals remarkably well, and a satisfactory result should be obtained if an effort is made to keep the suture line away from the channel between the two sesamoid bones at the base of the thumb.

In the palm, primary suture of the flexor tendons usually is justified, and here it often is possible to suture both the profundus and the sublimis, interposing the lumbricalis muscle between the sutured tendons. In the carpal tunnel—where, incidentally, tendon division seldom occurs—primary repair is often possible, but here it is wise to repair only the profundus tendon.

Above the wrist, in the lower forearm, every effort should be made to secure primary tendon repair. The profundus tendon always should be sutured, and the sublimis tendon frequently may be repaired also.

In the two last-named areas, one finds that almost always the median nerve is divided. and frequently the ulnar nerve is divided. These nerves should be sutured primarily also, when the tendons are repaired. Contracture of the forearm muscles and deformity of the digits are so great following this extensive injury that primary nerve and tendon suture should be done whenever possible.

Secondary Repair of Tendons

There are certain conditions or situations which contraindicate primary tendon suture. The presence of fractures usually precludes tendon suture, since the line of suture and the bone callus usually lie in juxtaposition and become adherent to each other. Likewise, the skin overlying the site of repair must be satisfactory; if the skin is missing and must be replaced, primary tendon suture cannot be accomplished.

When tendon suture is not permissible for one reason or another, the wound is cleansed,

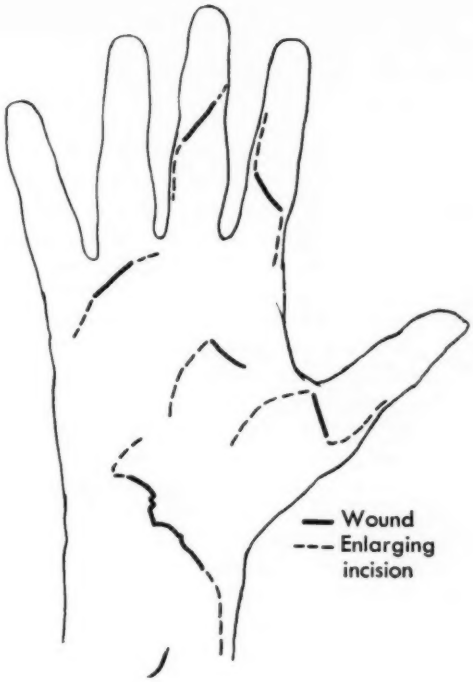

FIGURE 2. Adequate access is necessary to permit repair without rough handling and retraction. Enlarging incisions are so made as to follow physiologic lines; they must not lie in the mid-line, they must not cross flexion creases and, above all, the vicious cruciate enlargement must be avoided.

excised and closed. After healing has taken place and all hardness and induration have disappeared, secondary repair may be undertaken. If the wound heals without reaction and if the joints are kept freely mobile, the hand usually may be reopened in three to five weeks for secondary repair.

Occasionally, secondary tendon repair consists of suture, but more often a tendon graft is required. It would be difficult to discuss every contingency which may confront the surgeon, but in general he should always be prepared to perform a tendon graft.

The most common site of secondary tendon repair is on the volar surface of the digits, where a tendon graft is practically always necessary. If both the profundus and the sublimis tendons are divided, their remnants are

removed and a graft is inserted from the distal phalanx upward through the finger into the palm. Here it is attached to the stump of the proximal profundus in the region of the lumbricalis muscle origin. In preparing the graft bed in the finger, one should preserve segments of the vaginal ligaments over the proximal and middle phalanges to act as pulleys and prevent subsequent bowstring deformity. If these ligaments have been destroyed, one must fashion new ones by utilizing either remnants of the sublimis tendon or tendon grafts.

Occasionally it is possible to suture the profundus tendon secondarily when it alone has been divided near the distal end of the middle phalanx. But this is true only when the proximal stump of the profundus has been prevented from retracting too far proximally by a strong vinculum which holds it usually near the proximal interphalangeal joint. In such a case it is sometimes possible to draw the proximal stump through the tunnel and suture it to the distal phalanx. More often, however, the proximal stump has become so thick and bulbous that one cannot insert it into the tunnel, or it has retracted up into the palm.

A fair amount of controversy surrounds the problem of what to do when the profundus alone is divided. There are two points of view concerning repair. A number of surgeons contend that loss of active flexion of the distal interphalangeal joint is not a great handicap, and that if the distal joint is fixed in a flexion of 15 to 30 degrees by a tenodesis or an arthrodesis the function will be quite good. These surgeons likewise argue that the results of repairing this injury by inserting a graft through the fork of the sublimis and attaching it to the distal phalanx are not very good and that often the whole finger becomes stiff and useless.

Another group of surgeons believe that with very careful technic a tendon graft may be inserted in the finger to replace the divided profundus. The graft is led through the fork of the sublimis tendon, which is left intact, and inserted into the stump of the distal profundus beyond the interphalangeal joint. The percentage of successful results achieved by this means is high enough to justify the procedure. In those instances when active motion is not regained, the graft still is helpful in that it holds the distal joint in slight flexion. If the graft fails, therefore, it still accomplishes what a tenodesis or an arthrodesis does, whereas if the graft is successful it provides active motion.

I shall not discuss the technic of repair and splinting, after-treatment and the many other details necessary to success. I cannot emphasize too strongly that in few fields of surgery does technic or craftsmanship count for so much. Unless the surgeon has mastered the many details of operative technic, both he and the patient are better off if he does not attempt surgical repair of tendons in the hand—the surgeon because he will save himself many hours of difficult work which would be wasted because of disturbed healing; the patient because his wounds, if simply closed and allowed to heal, may be reopened under more favorable circumstances and repaired with a good chance of success.

Summary

The repair of tendon injuries to the hand may be carried out as a primary or a secondary procedure, depending on various factors such as time, nature of the wound, location of the injury, and available facilities. When the surgeon is in doubt as to the feasibility of immediate repair, it is better to err on the side of conservatism and to cleanse and close the wound, postponing tendon repair until healing has occurred.

Use and Abuse of Heat in Physical Medicine and Rehabilitation

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HEAT was a well-established therapeutic measure long before the advent of the thermometer and the evolution of physiology. Like aspirin, it is relatively safe, inexpensive, readily obtainable and often misused. Its usefulness has increased as we have learned more about production, selective application and physiologic effects. Because of the enormity of the subject I will limit this discussion to the more common means of heating local areas of the body.

The correct application of this therapeutic measure requires an understanding of the normal production and regulation of body heat as well as the physiologic effects of applied heat. Comprehensive articles on these aspects of the subject are readily available and I shall review them only briefly.

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Normal Regulation of Body Heat

The sustained body temperature of man is the result of a dynamic process of control between heat production and heat loss to the environment. Regulating centers in the hypothalamus act as physiologic thermostats to balance production and dissipation of heat according to the needs of the body and changes in the environment.

Chemical processes are responsible for heat production within the body. Therefore, the best sources of this heat are the body organs with the highest rates of metabolism, namely, the skeletal muscles, heart, liver, kidneys and gastrointestinal tract.

Loss of body heat depends largely on physical factors, primarily the environmental temperature and humidity. When environmental temperature is lower than body temperature, most of the heat loss is due to radiation, con-

duction and convection. When the temperature of the environment rises above that of the body, vaporization becomes the most important means of heat loss. Even at room temperature, about 25 per cent of the total loss is due to evaporation from the skin and respiratory tract. A high atmospheric humidity decreases the efficiency of all these avenues of loss. No heat is lost through vaporization if sweat is allowed to run off the body without evaporating. Other avenues of heat loss account for less than 10 per cent of the total.

The hypothalamic centers are influenced (1) directly by the temperature of the blood flowing through them and (2) reflexly by impulses from the cutaneous sense organs for cold and warmth. These centers exert their influence through somatic and visceral motor neurons to alter the rate of production or loss of heat. Hyperthermia is prevented by cutaneous vasodilatation, redistribution of blood to bring a greater percentage to the superficial blood vessels, increase in blood volume and dilution, increase in cardiac output, sweating, and panting. Hypothermia is prevented by increase in tone of skeletal muscles, cutaneous vasoconstriction with diversion of blood from the surface to deeper organs, decrease in blood volume, and hemoconcentration.

Effects and Uses of Local Application of Heat

Regardless of the form in which heat is used, the physiologic responses are basically the same: (1) The temperature in the area increases and (2) vasodilatation occurs. The rise in temperature causes an increase in local metabolic activity and this in turn increases local heat and vasodilatation. The vasodilatation increases the rate of blood flow and consequently the rate of transfer of fluid from the blood to the tissues. In the presence of a normal cardiovascular system much of this heat is quickly dissipated, thus preventing an excessive rise in local temperature. The rest of the heat is conducted to deeper tissues.

Variations in effects of local heating depend on (1) depth of initial penetration, (2) time necessary to attain an adequate increase in temperature of deeper tissues, (3) extent of area treated and (4) adequacy of the peripheral circulation.

Studies on the changes in blood flow with various heating devices seem to point to two types of response.[1,2] If a large surface area is heated slowly, a generalized response of heat-dissipating mechanisms results and blood flow in deeper structures decreases. If a small area of deeper tissue is heated quickly, local dissipation of heat results and blood flow increases.

There is no question that one of the possible effects of local heat is the relief of pain. The physiologic mechanism of this effect remains obscure. Wells[3] proposed that one factor is the equalization of differences in temperature between superficial and deep tissues. It does not appear that local heat, alone, has any effect on the flow of lymph.[4]

Since heat alone is not a specific cure for any disease or dysfunction, I will not attempt to enumerate all the conditions which might benefit from it. In general, heat is most useful in the treatment of localized, subacute and chronic lesions of the musculoskeletal system. Unfortunately, some of the conditions in which it is used with definite value are not thoroughly understood, e.g., nonspecific fibrositis, myositis, tendonitis and tenosynovitis. Heat is successfully used in areas of local trauma such as sprains, strains, fractures and contusions, but only after the initial inflammatory reaction has subsided. It may be used in areas of suppuration if drainage is established and maintained. Heat may aggravate acute arthritis but is of great help in relief of pain and stiffness in patients who have chronic rheumatoid arthritis or osteoarthritis.

Contraindications and precautions in local heating—In acute inflammation, regardless of etiology, heat will aggravate the condition by increasing the edema and congestion. Direct application of heat to areas with impaired or obstructed circulation is strictly contraindicated, and attempts at reflex heating of such areas are of questionable value. Obstructed venous flow prevents heat dissipation; obstructed arterial blood flow cannot meet the increased metabolic demands. Heat should never be used over areas where malignancy is

known or suspected, since increased rate of metabolism affects both normal and abnormal tissue. Heat of low intensity should be used in the presence of hemorrhage or where there are known hemorrhagic tendencies.

Because of poorly controlled regulation, one should exercise great caution in employing any form of heat in treating aged patients and young children. Areas of acute trauma should be avoided until the acute reaction has subsided—usually at least 24 hours. Constant attention is necessary when, for any reason, the patient is unable to report heat sensation. All coverings should be removed from the treated areas so that the skin can be observed and because fluid which collects under dressings increases the danger of burns. Skin lesions, general debility and impairment of the cardiovascular, renal or respiratory system all require special individual consideration.

Specific sources and therapeutic characteristics—Available sources of local heat for therapeutic application range in complexity from heated water to ultrasonic waves. By utilizing a somewhat arbitrary division one can classify them as superficial and deep. This classification is based primarily on depth of temperature increase in the tissues but lends itself well to the grouping of other characteristics of the sources. The sources of superficial heat are relatively safe, inexpensive, poorly controlled, readily available and more direct. Sources of deep heat have reciprocally opposite characteristics.

Superficial Heat

A partial list of common means of directing heat to the surface of the body includes hot water bottles, hot moist compresses or packs, hot water, electric heating pads, heated air cabinets, heated moist air, heated paraffin, and both luminous and nonluminous infrared generators.

Effects of infrared generators,[5-7] hot packs,[8] Hydrocollator packs,[9] whirlpool baths[10] and moist air cabinets[9,11] have been studied. There is little scientific basis for superiority as far as depth of temperature rise is concerned. In general, the following statements apply to all these apparatus:

1. Superficial heating devices result in a temperature gradient from the skin inward. The greatest increase occurs in the skin and subcutaneous tissue, reaching a maximum in 10 to 15 minutes; increase in muscle temperature is significantly less and reaches a maximum in about 30 minutes. The temperature increase is negligible beyond 1 to 2 cm.

2. When an area smaller than one lower extremity is heated, increase in body temperature (rectal) is not noted if normal heat dissipation from the rest of the body is allowed.

3. Heat applied to one extremity may increase the superficial temperature and superficial blood flow of the contralateral limb.

4. Intensity of the applied heat is based on comfortable tolerance.

Because many of the conditions for which heat is used are chronic in nature, a home program can be established. Superficial heating devices in the home have a definite place in a planned treatment program. Hot water bottles, electric heating pads, heated paraffin, hot water immersion, or heat lamps are commonly used. Simple instructions in their proper usage can eliminate most of the dangers of such heating. Wrapping a hot water bottle in a towel not only prevents burns but also preserves the heat for a longer period. The dangers of electric heating pads far outweigh any value they might have. Hot water immersion and heated paraffin are just as valuable in the home as in the hospital. The whirlpool bath is a very useful tool but proof of its superiority over still water is lacking as far as heating effects are concerned.[10] An ordinary water thermometer is an inexpensive way to insure safe application.

Infrared bulbs and lamps are potentially more dangerous than hot water bottles, paraffin or hot water in that the heat is sustained. Often the soothing effects of the heat cause the patient to fall asleep before the device is turned off, and severe burns can result. A timing device will limit this hazard.

Infrared lamps and bulbs usually do not have a rheostat to control intensity. The distance from the bulb to the treated area is of utmost importance. When using any therapeutic lamp, two laws of physics should be

kept in mind, namely, the inverse square law and the cosine law. In general, the higher the wattage of the bulb, the greater the distance should be between the lamp and the patient. Remember that as the distance increases, so does the exposed area. Therefore it is better to use a bulb of low wattage at short distance for small areas and a bulb of high wattage at greater distance for larger areas. When a lamp is placed parallel to the surface irradiated, the intensity of radiation is the greatest; as the direction of the rays become more oblique in relation to the surface treated, there is a general decrease in the intensity.

Since all sources of superficial heat produce essentially the same effects, the type selected and its application depend on (1) availability of source, (2) extent of area to be treated, (3) depth of effective penetration, (4) time necessary to produce desired effects, (5) ease of application, (6) margin of safety, and (7) individual preference.

Deep Heat

Deep heating of tissues is obtained by medical diathermy—a designation given to the use of high-frequency currents for the generation of heat in the tissues. The primary energy penetrates the tissues and is there converted into heat. I will limit discussion to the three most common diathermies used at present, namely, short wave, microwave, and ultrasound. All diathermy machines are operated under regulations of the Federal Communications Commission.

Short wave—Short wave diathermy can be applied by two methods: (1) induction cable which provides an electromagnetic field and (2) condenser pads or air-spaced electrodes which provide an electrostatic field. The induction method is more effective in increasing temperature in more highly conductive tissues such as muscle, and the condenser method in the less highly conductive tissues such as skin, fat and bone.[12] Therefore the induction cable is the method of application that is preferred.

Wavelengths of short wave diathermy range from 3 to 30 m. with a frequency of 10 to 100 mc. In this type of diathermy the patient is a part of the electric circuit so there is a significant spread of the energy within the tissues. Short wave diathermy heats a much larger amount of tissue than does any other type of deep heat. Selective heating with this modality depends on conductivity of tissues. This means that no real focusing of heat is possible with this type of diathermy. Skin and subcutaneous tissues show the greatest increase in temperature and the maximum is attained in about 10 to 15 minutes. A significant rise in temperature does not occur beyond 3 cm. (superficial muscle level), and this peak is reached in about 30 minutes.[13]

Microwave—Microwave diathermy is a form of electromagnetic radiation generated in a magnetron tube and connected by a coaxial cable to a director. This electric energy has a frequency of 2,450 mc per second with a wavelength of 12.2 cm. Because these waves possess the optical properties of reflection, refraction and diffraction, they can be focused and directed. Osborne and Frederick[14] have outlined the surface heating patterns of the currently available microwave directors. With microwave diathermy the maximal increase of temperature in muscle is obtained in 20 minutes and an increase in flow of blood follows; the decrease in temperature which follows a 30 minute exposure is considered a result of this increase in blood flow.[15] Effective increase in temperature at a depth of 5 cm. with minimal evidence of skin erythema is a fairly consistent finding.[16]

Schwan and Piersol[17] reviewed the many reports (often contradictory) on microwave with the following conclusions: Microwave apparatus, as presently produced, is capable of overbridging fatty subcutaneous tissue and transforming the major part of its energy into the deeper muscle, if the fat layer is no thicker than ½ in. Whether surface or deep tissues are heated depends primarily on certain factors such as surface cooling, the thickness of the fatty layer, and heat exchange within the tissues.

Ultrasound—Ultrasound for therapeutic purposes consists of mechanical vibrations with frequencies ranging from 0.7 to 1.0 mc. Such vibrations are produced by a piezo-elec-

TABLE 1

GENERAL COMPARISON OF EFFECTS OF VARIOUS SOURCES OF LOCAL HEAT

MODALITY	REACTION TIME	POSSIBLE SURFACE AREA TREATED	DEPTH OF PENETRATION	DEPTH OF INCREASED TEMPERATURE	INCREASE IN DEEP BLOOD FLOW	MARGIN OF SAFETY	SELECTIVE HEATING
Infrared	Slow	Large	Skin	1-2 cm.	None	Large	None
Short wave	Slow	Fairly large	Skin and subcutaneous tissue	2-3 cm.	May or may not	Fairly large	Tissue conductivity only
Microwave	Fast	Small	Deep	5 cm.	Usually	Small	Great variability
Ultrasound	Very fast	Small	Deepest	5+ cm.	May or may not	Small	Selective at interfaces of different tissues

tric crystal which converts oscillating electric current from a generator into mechanical vibrations.[18] Unlike electromagnetic radiation, ultrasonic waves of these frequencies and at intensities used in therapy do not pass through air or a vacuum but require a material medium for transmission from the applicator to the surface treated.

Ultrasound can be applied by two methods: (1) in contact with skin, using a coupling medium such as mineral oil, and (2) underwater applicator ½ in. to 2 in. from the affected part with the water acting as a coupling medium. In either case the head of the applicator is slowly moved back and forth across the area being exposed, for if it remains stationary the heat production is greatly intensified and pain results. Since excessive amounts can be destructive to tissues and since pain indicates excessive heat, pain should be avoided.

The suggested dosages range from 0.5 to 6 W per square centimeter if the applicator radiating area is not more than 10 sq. cm. The length of the treatment is somewhat empiric, ranging from 3 to 10 minutes and varying with the intensity used and the size of the area treated.

The chief physiologic effects of ultrasound are believed to be thermal when therapeutic dosage is used. True selective heating occurs at interfaces formed by the junction of tissues of different acoustic properties such as muscle-bone, muscle-tendon or muscle-fascia junctions. Depth of penetration of ultrasound depends on intensity but it will penetrate 5 cm. within recommended dosage range. It will successfully bridge the subcutaneous fat to heat deeper muscle tissue.

Table 1 gives a comparative summary of the effects of various sources of local heat.

Like superficial heating, dosage of all the deep heating methods depends to some extent on subjective sensation. Comfort is the rule of thumb. Because the rise in temperature is usually greater below skin level with microwave and ultrasound, intensities should be decreased or treatments discontinued at the first awareness of any painful sensation of heat. The dials on diathermy machines may indicate energy output but do not indicate the amount of heat absorbed. The recommended technics and dosage supplied with the machine are based on research and clinical studies to serve as a guide for the practitioner.

In addition to general contraindications for all forms of local heat, there are some specific cases where deep heat should not be applied. Deep heat in any form should not be given when there is metal in the area treated, over a pregnant uterus, or over a fracture site before the callus has formed. Extreme caution should be observed in using microwave over the eyes, testes, growing bone or superficial bone and

where tissues contain an excess of free fluid. Application of ultrasound is specifically contraindicated in or about the brain, eyes, ears, accessory nasal sinuses, heart, reproductive organs, epiphyses of growing bone, and the large autonomic structures such as the celiac, mesenteric, pudendal and aortic ganglion plexuses.

Conclusion

Since heat cures nothing, it is used primarily for symptomatic relief of pain, chronic inflammation and stiffness. It should be assiduously avoided in the presence of peripheral vascular disease, acute inflammation or neoplasm. Dosage of all types of local heat is controlled by the patient's subjective analysis of its effects. Numerous sources of heat are available to practitioners, each with specific therapeutic characteristics, but one must remember that effectiveness is not necessarily directly related to the cost or to elaborate machines.

Superficial heating devices are more adaptable for heating large surface areas. If properly used, their margin of safety is fairly wide, but their depth of temperature increase is limited. Deep heating with diathermy is more useful for rapid increase in temperature in deeper tissues in a small area. The dangers of excessive heating are much greater than with superficial heating. Greater knowledge and technical skill are required for adequate and safe use of deep heating devices.

In general, short wave diathermy has little superiority over properly used superficial heat. Further studies and clinical evaluation are necessary of both the present machines and the machines which may be developed in the future before precise indications and contraindications can be established.

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Other papers in this series will follow in succeeding issues.

SYMPOSIUM

Jaundice

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KENNETH W. WARREN,[3] WARREN E. WHEELER[4]
AND HAROLD R. ROSSMILLER[5]

DR. ZOLLINGER (Moderator): We have not planned any set presentation, and so let us get right to the business at hand; we have 60 minutes to solve the jaundice problem. Dr. Goldblatt, can you give us a classification of jaundice to help organize our thinking about the subject?

DR. GOLDBLATT: Had you asked me that question 10 years ago, I would have answered, unhesitatingly: hemolytic, obstructive and parenchymal. More recently, however, Dr. Rich has presented a different classification which perhaps is better, even though at first it seems more complicated. He divided jaundice into the retention and regurgitation forms. The retention form is subdivided into two main types, that which is associated with overproduction of bile and that in which there is decreased excretion of bile. The regurgitation form, which term implies rupture of the bile capillaries or canaliculi, is subdivided into obstructive and hepatocellular types. The latter subdivision would be satisfactory provided the two types always were clear and distinct, but unfortunately they overlap. For example, a case of biliary cirrhosis may be both obstructive and hepatocellular.

ROBERT M. ZOLLINGER

DR. ZOLLINGER: The classification has been expanded, then, rather than simplified.

DR. GOLDBLATT: No, I don't think that. I believe Dr. Rich has guided us into some pretty clear thinking on the subject.

Differential Diagnosis

DR. ZOLLINGER: Dr. Wheeler, if jaundice which has been considered physiologic jaundice of the newborn persists, at what point do you consider it pathologic, and how should it be investigated?

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HARRY GOLDBLATT

KENNETH W. WARREN

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HAROLD R. ROSSMILLER

DR. WHEELER: The definition "physiologic jaundice" implies that it will go away. One sees physiologic jaundice of the newborn usually around the third or fourth day; it should be subsiding by the fifth day. Any jaundice that is increasing in severity at that time or lasts after the first week should be considered pathologic.

DR. ZOLLINGER: How do you check whether or not the jaundice is clearing—by gross appearance or by certain tests?

DR. WHEELER: Certainly you ought to be able to see jaundice fading rapidly at the end of a week.

DR. ZOLLINGER: Do any other members of the panel disagree with this? If not, Dr. Rossmiller, what factors in the history and physical examination help to distinguish between medical and surgical jaundice? Do we depend too much on the laboratory, or can we gain a lot of information from the history and physical examination?

DR. ROSSMILLER: The history and physical examination probably are the crux of the differential diagnosis of the various forms of jaundice. If you take a careful history and perform a thorough physical examination, you will learn a great deal and have a good idea of the cause of jaundice before you order any laboratory studies, x-rays or liver biopsy.

What do you want to know about the patient's jaundice? You want to know, first, whether or not the patient had any prodromal symptoms—arthralgia or a syndrome that would suggest hepatitis. Next, did he have weakness, nervousness and vague gastrointestinal symptoms prior to the onset of jaundice? These symptoms would favor the diagnosis of cirrhosis of the liver. Has the patient been exposed to blood or any of its products? Has he been exposed to any drug, to carbon tetrachloride, or to one of the currently popular tranquilizers?

The presence or absence of pain is of considerable importance. Did the patient have pain before jaundice appeared or has he had pain since it appeared? The presence of pain, of course, suggests that the treatment will be surgical in nature. It is well to remember that some persons with hepatitis and cirrhosis have so-called pseudobiliary colic.

It is also important to determine whether or not the patient has had jaundice previously. Many persons with hepatitis have jaundice for a while, and then it disappears and later it recurs. I think the same situation applies in cases of cirrhosis—a sort of spontaneous remission.

In an average case of stones in the common duct, the patient may have a bout of jaundice, but it will generally last a week or so and then subside. Find out whether or not the patient has had cholecystectomy and, if so, whether or not any stones were found or the common duct was explored.

DR. ZOLLINGER: More specifically, Dr. Rossmiller, what are the most important points you want to establish from the history? If you were to ask a jaundiced patient just three questions, which three would you choose?

DR. ROSSMILLER: (1) Prodromal symptoms, (2) pain and (3) exposure.

DR. ZOLLINGER: Dr. Warren, what would be your choice?

DR. WARREN: As Dr. Rossmiller already suggested, we should ask the patient whether or not he has had a previous operation. We try to categorize the problem, and again Dr. Rossmiller has covered most of the details. For instance, if we suspect that a patient has stones in the common duct, we want to know if he has intermittent pain, and, if he is aware of jaundice, is that jaundice variable or intermittent? If we suspect that he has carcinoma of the pancreas, we want to know whether or not he has had a long insidious history characterized by weakness, fatigue, vague pain, weight loss, and the subsequent development of jaundice. If we suspect carcinoma of the ampulla of Vater, was the onset of the illness abrupt and did progressive jaundice occur shortly after the initial symptoms? These patients initially may or may not have mild abdominal pain.

DR. ZOLLINGER: Dr. Rossmiller, what about the physical examination? Do you think it helps much, other than establishing that the patient is yellow?

DR. ROSSMILLER: It helps a great deal. First of all, the depth of the jaundice is important. The deeper the jaundice, the more likely it is due to hepatic disease.

DR. ZOLLINGER: Do you think you can tell by the appearance—canary yellow versus lemon yellow, for instance?

DR. ROSSMILLER: I don't think you can tell that, but you can look at the eyeballs and see whether the color is mild or deep. The next thing you want to know is whether secondary signs of liver disease are present—spider angiomas, so-called "liver palms," loss of body hair, loss of body muscle, testicular atrophy, and occasionally gynecomastia.

DR. ZOLLINGER: Isn't that more common with cirrhosis than with ordinary jaundice?

DR. ROSSMILLER: Jaundice frequently occurs in cirrhosis, and that is one of the differential points—whether the jaundice is due to cirrhosis or to some other disease.

The size of the liver is important. The larger the liver, the greater is the likelihood that it is due to cirrhosis or metastatic carcinoma. In obstructive jaundice, the liver generally is not down more than 6 to 8 cm.

If the gallbladder is present, it is important to determine whether or not it is palpable. If it is palpable, the jaundice almost certainly is due to a condition that will require surgical treatment.

A palpable spleen is an important finding, because it does not occur in biliary cirrhosis due to obstruction of the common duct unless the condition is one of long standing.

The presence of ascites and edema can mislead you at times. I have seen patients with ascites and edema who had stones in the common duct.

DR. ZOLLINGER: Dr. Wheeler, are there any special points in the physical examination of children with jaundice?

DR. WHEELER: No, I would not think so, except that in cases of children we have a different set of conditions in mind. We would not be considering malignancy so much as we would congenital malformations, cysts or enlarged glands from inflammation, which would produce obstructive jaundice.

DR. ZOLLINGER: We have heard a lot about pruritus accompanying jaundice. Does this occur in children?

DR. WHEELER: Yes, little babies with obliteration of the bile ducts scratch themselves after the first few months of life.

DR. ZOLLINGER: Dr. Warren, what do you think about pruritus? Does it help in distinguishing between medical and surgical forms of jaundice?

DR. WARREN: Not a great deal, except that patients who have hemolytic icterus will not itch; patients with the other two varieties frequently will. On a mathematical basis a patient with obstructive jaundice is more likely to have pruritus than is a patient with hepatitis, but it may occur with either condition.

DR. ZOLLINGER: Dr. Rossmiller, do you agree?

DR. ROSSMILLER: In my opinion the symptom of pruritus is grossly overemphasized.

DR. ZOLLINGER: But if the patient has pruritus, do you have a way to control it other than by scratching?

DR. ROSSMILLER: I am sorry to say I do not. We try methyltestosterone, but I am not impressed with it.

DR. WARREN: Do you use methyltestosterone just in male patients?

DR. ROSSMILLER: No, we have used it in both male and female patients.

DR. ZOLLINGER: Does it work in Boston, Dr. Warren?

DR. WARREN: No, it does not. I do not know any way to control pruritus in cases of jaundice. What surprises me is that it is not the intensity of jaundice that determines whether or not a patient has pruritus. In a case of obstructive jaundice, pruritus usually will disappear within a day or two after the obstruction is relieved, even though the intensity of the jaundice remains essentially unaltered, with the bilirubin 15, 18 or 20 mg. per cent.

DR. ZOLLINGER: Dr. Goldblatt, what is the reason for the pruritus?

DR. GOLDBLATT: My understanding is that it is attributable to the accumulation of bile salts, and that is why it is most pronounced in the truly obstructive form of jaundice, although it may be present in other forms. As in the case of the slowing of the heart, the bradycardia, which occurs under these conditions, so also in the case of the pruritus the symptoms are attributable, I believe, to the accumulation of bile salts in undue quantities in the blood.

DR. ZOLLINGER: Dr. Warren, do you make a diagnosis of surgical jaundice on the basis of the history and physical examination, or do you place more emphasis on laboratory determinations?

DR. WARREN: I am reluctant to speak like an internist, but I would agree with what has been said—that the history and physical examination are among the most important aspects of the diagnosis. As I already stated, in taking a careful history we not only consider whether or not the jaundice is obstructive but we also categorize it. If it is obstructive, is it due to a common duct stone or to carcinoma of the ampulla of Vater, or is it a carcinoma of the head of the pancreas?

DR. ZOLLINGER: What laboratory data do you request?

DR. WARREN: The laboratory data I depend on most are—

DR. ZOLLINGER: What test would you order?

DR. WARREN: Well, what I order and what I depend on are two different things. I order the whole battery of liver function tests. In terms of diagnosing obstructive jaundice, the things I like to see elevated are these—

DR. ZOLLINGER: List them slowly; the boys are writing them down.

DR. WARREN: I say I would like to see them; I do not necessarily mean that they are reliable in every instance, because they certainly are not.

DR. ZOLLINGER: We asked which are the most reliable.

DR. WARREN: One test I like to see elevated, in terms of diagnosing obstructive jaundice, is the alkaline phosphatase.

DR. ZOLLINGER: What are the normal levels in your laboratory?

DR. WARREN: The normal probably is 6 or 8, but we like to see the value above 10. Elevation of the cholesterol is helpful.

DR. ZOLLINGER: Do you mean an alkaline phosphatase of 14 or 15?

DR. WARREN: Yes. I would be impressed with it.

DR. ZOLLINGER: You would be impressed, but that is all?

DR. WARREN: These are largely relative, I am sure. As the conclusions will finally be related to you, these are impressions.

DR. ZOLLINGER: What is the No. 2 test?

DR. WARREN: I also like to see, of course, minimal if any deviation from normal in the results of liver function tests, such as the cephalin-cholesterol flocculation and thymol turbidity.

DR. ZOLLINGER: If these were elevated, would you refuse surgery?

DR. WARREN: That depends on the degree of elevation. Dr. Goldblatt already has emphasized that different types of jaundice overlap in respect to these findings.

DR. ZOLLINGER: Let us say they were elevated just enough to be elevated.

DR. WARREN: If the elevation were plus 1 or plus 2, no. If the alkaline phosphatase and cholesterol were elevated, and if, in addition, data from the history and physical examination suggested obstruction, I certainly would not hesitate to operate.

There is one other test for common duct stones that is very simple. If the bilirubin is elevated 12 hours after an attack, and 24 hours later it is diminishing, that is a very important finding. It has nothing whatever to do with the other tests.

DR. ZOLLINGER: Are there any other tests you rely on?

DR. WARREN: Those are the ones we rely on primarily.

DR. ZOLLINGER: Do you pay attention to prothrombin?

DR. WARREN: We pay a great deal of attention to it, perhaps less in terms of diagnosis than in terms of response to administration of vitamin K in preparation for surgery.

DR. ZOLLINGER: What type of vitamin K do you give, and how much and for how long?

DR. WARREN: We give 5 mg. of HYKINONE® intramuscularly every day, and we measure prothrombin levels serially. If we have a patient who is bleeding, then I think we employ vitamin K_1, empirically more than for any other reason. Whether it is superior or not I do not know. I think we will have to ask the pathologist.

DR. ZOLLINGER: Dr. Rossmiller, what about prothrombin levels and the use of vitamin K? What dosage do you give?

DR. ROSSMILLER: If we are merely trying to influence the prothrombin time, we give 72 mg. of Hykinone intravenously.

DR. ZOLLINGER: How did you arrive at that mystical figure of 72?

DR. ROSSMILLER: That is the ampule unit issued by the manufacturer.

DR. ZOLLINGER: I have the impression that large doses do not contribute too much, and they are expensive. Some observers believe that a dosage of 5 or 6 mg. is all that is needed, while larger dosages only insure expensive urine.

DR. WARREN: I think a small dose is needed in most instances. Another feature to remember is that vitamin K is stored. It will be stored for longer than 24 hours. I think we use it every 24 hours for the first few days, because we want to try everything we can, but I am sure that a great deal of vitamin K is wasted.

DR. ZOLLINGER: How about cholesterol esters or total cholesterols and some of those things, Dr. Rossmiller?

DR. ROSSMILLER: We do not often determine the cholesterol-cholesterol ester ratio. I have not had sufficient experience with this test. However, I would like to make an additional comment about the tests Dr. Warren mentioned, so far as surgical jaundice is concerned. I think the two most important findings are: (1) continued absence of bile from the stool, and (2) a depression of the urinary urobilinogen. I do not think the alkaline phosphatase level has much value unless it is low. I have seen levels of 30 to 60 units in patients who had cirrhosis of the liver.

DR. ZOLLINGER: We don't pay much attention to urinary urobilinogen. You have great confidence in this test?

DR. ROSSMILLER: Yes, I have great confidence in it. I am not talking about testing single isolated specimens of urine for urobilinogen; I think that is worthless. But if you do a careful two hour test and there is consistent reduction in the urinary urobilinogen, I think it is of considerable significance.

DR. ZOLLINGER: In favor of what?

DR. ROSSMILLER: Obstructive jaundice.

DR. ZOLLINGER: Under those circumstances, wouldn't a stool examination tell you the same thing?

DR. ROSSMILLER: Yes, but that is just a double check. It is simple to check the stool; all you have to do is put on a rubber glove.

DR. ZOLLINGER: If the stool is clay-colored, isn't that enough?

DR. ROSSMILLER: No, I still like to measure the urinary urobilinogen.

DR. ZOLLINGER: Dr. Warren, what is your opinion on this?

DR. WARREN: As I remarked initially, we do all these tests. You asked me which I preferred. The urinary urobilinogen test depends on the complete or almost complete exclusion of bile, and many patients with jaundice do not have complete exclusion. Even a patient with carcinoma of the ampulla may be getting some bile through, but the patient who is least likely to get any bile through is the one with carcinoma of the head of the pancreas or of the ampulla, or, in Dr. Wheeler's category, the

patient with congenital atresia or complete obstruction from some congenital defect.

DR. ZOLLINGER: Dr. Goldblatt, as a pathologist what do you think of liver function tests? Are you discouraged with them? Do you view them with alarm?

DR. GOLDBLATT: The discouraging thing, of course, is the fact that the laboratory has to do all the tests. As you have heard, the clinicians have certain preferences but they usually order all of them, and that means a big load on the laboratory. But I do believe they all have a part, and I agree with Dr. Warren that we should ask for many tests because of the overlapping findings, which I have stressed. The diagnosis is not always clear-cut, so I think that the laboratory should work hard to help the clinician clear up the mystery—and sometimes it remains a mystery.

DR. ZOLLINGER: What do you consider a battery of liver function tests?

DR. GOLDBLATT: All those that have been mentioned, from the cephalin-cholesterol flocculation and thymol turbidity tests to the bilirubin in the blood and the urobilinogen and bile in the urine. We should also help to answer the question whether it is a direct or an indirect-reacting type of bilirubin, and so the battery should include any and all tests that are likely to help make a diagnosis.

When there is a regurgitation form of jaundice, in which there is damming back of bile into the blood, and it is the true obstructive type, then the direct van den Bergh reaction is the one that is positive. Unfortunately, in some cases, both the direct and the indirect reactions may be positive, and one has to evaluate those results in the light of the clinical manifestations.

DR. WHEELER: I think in childhood the most important single finding is the absence of bile in the stool. In small babies with intense jaundice who have slimy, mucus-containing stools, some difficulty may arise because bile may be excreted in the mucus and become mixed with the stool. If a baby has a formed stool, one should cut through the stool and see if it is clay-colored on the inside even if it is yellow outside. Such a stool is really a clay-colored stool.

DR. ZOLLINGER: What about a baby who has intense jaundice in the first week of life? What do you do about it?

DR. WHEELER: In the first place it is not surgical jaundice, because, as far as I know, intense surgical jaundice does not occur in the first week of life. The most probable cause of intense jaundice in the first week of life is what Dr. Goldblatt would call overproduction of bile—in other words, hemolytic disease. The most important hemolytic disease is erythroblastosis, which you diagnose by means of a direct Coombs test of the baby's blood. The next most important condition would be a similar disorder which we in our clinic call icterus praecox but which everyone else calls OAB erythroblastosis, that is, an A baby of an O mother or a B baby of an O mother. Such a baby has hemolytic disease because of placental transfer of maternal antibodies against the A or the B blood group. You cannot diagnose this type of hemolytic disease by the Coombs test. You have to go by the difference in blood types between mother and baby, and in some laboratories you can test for what we call "immune type antibody." Prematurity, of course, accentuates the severity of either of these diseases.

There is another group that we do not see too often but which is pretty important, and that is babies who have hepatitis; and there are a lot of causes for hepatitis.

DR. ZOLLINGER: You mean babies are born with hepatitis?

DR. WHEELER: You bet, and you would be surprised at how many conditions can cause hepatitis—homologous serum hepatitis, probably ordinary infectious hepatitis transmitted across the placenta from a mother who has the disease. In addition there are a number of unusual viral diseases to which babies are subject, such as cytomegalic inclusion disease and neonatal herpes simplex. There also is an occasional case of toxoplasmosis, and, of course, there are bacterial septicemias, especially due to colon bacillus. All these latter diseases act as a kind of sepsis and at times can produce very intense jaundice.

In relation to the massive doses of vitamin K which Dr. Rossmiller mentioned, it has

been brought to the attention of the pediatricians that doses of 10 mg. given at birth and daily for three days, especially in premature infants, are followed in a considerable number of instances by the development of intense jaundice, often severe enough to produce kernicterus. Too much vitamin K at birth apparently is not good, and it causes jaundice for some unexplained reason.

DR. ZOLLINGER: You mean vitamin K should not be given to newborn infants?

DR. WHEELER: I am a firm believer that 1 or 2 mg. a day probably is all that is needed.

DR. ZOLLINGER: One dose of 1 or 2 mg.

DR. WHEELER: At least one dose a day, and probably not for longer than three days.

I would like to say one more thing about management of these cases. I am sure you are all acquainted with the staining of the brain by bilirubin which is associated with mental deficiency and deafness. That is what we call kernicterus, and it used to be fairly frequent in babies suffering from erythroblastosis. Now that we have learned to treat erythroblastosis with exchange transfusions, we are beginning to realize that kernicterus can develop due to other causes as well. Any newborn baby, especially one younger than five days of age, in whom severe jaundice develops, especially if it is due to indirect-reacting bilirubin, is susceptible to kernicterus. Statistically it seems that if we can keep the level of bilirubin below 20 mg. per cent, we can practically always prevent kernicterus. We now feel that this is a very important part of the care of the jaundiced newborn infant—to keep the indirect bilirubin level in the blood from exceeding 20 mg. per cent during the first week of life.

DR. ZOLLINGER: How do you do that?

DR. WHEELER: By exchange transfusion. We remove the bilirubin-containing blood. We do it all at once in one exchange transfusion procedure. We take 10 cc. out and put 10 cc. back, and continue this until perhaps 500 cc. has been exchanged.

DR. ZOLLINGER: Most jaundiced persons lose more than 10 cc. a day just from the tests performed on them. What is the limit on the amount of blood you could give a youngster?

DR. WHEELER: As a rule we limit it to about a pint of blood exchanged at any one time, but if this does not produce the desired effects we may repeat it once or even twice about 12 or 24 hours later.

Isolation of Jaundiced Patients

DR. ZOLLINGER: Dr. Goldblatt, I have received a letter from a doctor who was quite upset because two patients with jaundice whom he sent to the hospital were placed in the contagious ward because of a shortage of beds. Do you know of any reason why a patient with jaundice which is not due to gallstone attacks should be isolated?

DR. GOLDBLATT: Yes, if there is a chance he might have acute viral epidemic hepatitis.

DR. ZOLLINGER: But you won't know that.

DR. GOLDBLATT: Take no chances, I would say. If there is any suspicion whatever of exposure to that type of infection, or even to the endemic type of hepatitis, the homologous serum jaundice, I would isolate such patients for a while, although usually they are not a great source of danger by the time they get into the hospital.

DR. ZOLLINGER: The clinician must make the diagnosis. What diagnosis should he give to insure isolation?

DR. GOLDBLATT: "Possibly viral hepatitis" should cover it.

DR. ZOLLINGER: Then a patient almost would have to be in the throes of gallstone colic or meet the requirements of Courvoisier's law with a large gallbladder to avoid isolation. Is that true in Boston, Dr. Warren?

DR. WARREN: With the number of patients we see who have jaundice, we would not have many patients in the private wards or the general wards if we did not limit such isolation to those who have a positive history of exposure. It is extremely important, however, to take a very careful history to determine exposure. If the patient definitely has been exposed, I think he should be isolated. But if you take a large group of patients with jaundice, particularly the type of jaundice we see, you will find only a small number that require isolation.

DR. ZOLLINGER: Dr. Wheeler, do you isolate babies with jaundice?

DR. WHEELER: The babies we care for are isolated anyway. Older children with jaundice we care for on the open ward or on the same floor with other children.

DR. ZOLLINGER: Dr. Rossmiller, what do you think about this?

DR. ROSSMILLER: I agree with Dr. Goldblatt that if you have a patient with infectious hepatitis—

DR. ZOLLINGER: But you do not know that. We are talking about a patient who is yellow. You see him for 10 minutes or so, and you send him to the hospital.

DR. ROSSMILLER: From a practical standpoint, in a general hospital I think it is impossible to isolate all these patients.

DR. ZOLLINGER: If the hospital offered such facilities, would you accept the policy gladly or would you be upset as the doctor was who wrote to me?

DR. ROSSMILLER: In the past 10 years we never have isolated any of these patients, and, so far as I know, with ordinary nursing care there has not been any cross infection. I think it is overdoing a good thing to isolate all patients with jaundice.

DR. ZOLLINGER: Dr. Warren, do you want to discuss this point further?

DR. WARREN: I agree with that completely. I think the only patient I can recall in this category was a surgeon who had hepatitis, and the only person in contact with him who acquired the disease was his wife, who became jaundiced three weeks after he went home.

DR. ZOLLINGER: I gather, then, that you are not too concerned that isolation is necessary. To puncture yourself with a needle is about the only way of transmitting the disease. On the other hand, do you see it transmitted from one member of a family to others?

DR. GOLDBLATT: It seems to me that the reason for this discussion is that in civilian life we see few cases of the epidemic type of hepatitis. Most of our experience has been with the homologous serum type of jaundice, which, as a matter of fact, is practically noninfectious by the time the patient gets into the hospital. If he is infectious at all, he is apt to transmit it to the members of the family before he ever gets to the hospital.

Needle Biopsy of the Liver

DR. ZOLLINGER: What about needle biopsy? Dr. Warren, do you favor its use?

DR. WARREN: We place very little reliance on it.

DR. ZOLLINGER: Do you favor it? Do you use it? Yes or no.

DR. WARREN: I would have to vote against this procedure.

DR. ZOLLINGER: Dr. Wheeler, do you use it in children?

DR. WHEELER: No, we take a look.

DR. ZOLLINGER: Dr. Rossmiller, do you use needle biopsy?

DR. ROSSMILLER: We use needle biopsy except in deep jaundice.

DR. ZOLLINGER: Dr. Goldblatt, can you tell us what you are looking at when you get a needle biopsy?

DR. GOLDBLATT: That all depends on who has done the job. The pathologist depends on what is given him, and sometimes this is entirely inadequate. At times we can make a definite diagnosis that perhaps can be made by other means, perhaps a definite carcinoma, or we may even get a decent portion of the liver which makes it possible to diagnose hepatitis.

DR. ZOLLINGER: Pathologists used to be fussy when the surgeon took just an edge of the liver; they wanted a very liberal, deep biopsy. Now they will settle for a little stringy piece collected through a needle. Dr. Goldblatt, have you ever examined a patient finally as a result of a needle biopsy?

DR. GOLDBLATT: I have not seen a fatal outcome from a needle biopsy of the liver.

DR. ZOLLINGER: Dr. Warren, you view needle biopsy with alarm. Have you ever seen a fatal outcome from its use?

DR. WARREN: No; I guess I am just cautious.

DR. ZOLLINGER: Dr. Wheeler, have you seen or heard of a fatal accident in this respect?

DR. WHEELER: I have not seen one.

DR. ZOLLINGER: Dr. Rossmiller, have you seen one?

DR. ROSSMILLER: We have had one death.

DR. ZOLLINGER: Deeply jaundiced, low prothrombin?

DR. ROSSMILLER: No, the patient's prothrombin concentration was 70 per cent. He had far-advanced Hodgkin's disease involving the liver, bone marrow and other organs.

DR. ZOLLINGER: Ordinarily, a low prothrombin level which cannot be brought up with therapy is a clear-cut contraindication to needle biopsy. Needle biopsy should be done in the morning so that you can observe any evidence of bleeding or signs of peritonitis in the right upper abdominal quadrant and can do the necessary surgical operation.

Surgical Jaundice in Infancy

How can one make a diagnosis of obstructive jaundice in infancy, Dr. Wheeler? In other words, when do you feel it is perhaps a surgical type of jaundice in infancy?

DR. WHEELER: As I said before, when jaundice develops in the second or third week of life, with bile in the urine, and you are convinced there is no bile in the stool, that is absence of the bile ducts until you are able to prove otherwise.

DR. ZOLLINGER: How long would you procrastinate before you would recommend surgery for congenital atresia of the bile ducts?

DR. WHEELER: Not too long. At one time it was quite common to say that these babies could be operated on at any time, and it was considered good practice to "let them get a good start in life and operate on them when they get bigger, and the operation is easier." The distressing feature about that attitude is that by six months or a year of age the biliary cirrhosis which results is severe and reason enough for the child to succumb. Surgical repair of malformations of the bile ducts should be done before three months of age at least, and preferably before two months of age. However, at any age there are quite a few cases of hepatitis of the newborn to worry about in which it would be wrong to attempt any exploratory operation.

Under local anesthesia or cyclopropane, we do a very minor operation consisting of an incision on the right upper quadrant, a small biopsy of the liver, and, if a gallbladder is present, a tube is inserted into this organ and a cholangiogram is made. The surgeon then retreats and waits for the pathologic report of the biopsy, assuming that by such a minor operation he has not injured a patient should it turn out that he has hepatitis. If the liver sections show evidence of biliary obstruction and do not show hepatitis, then a complete biliary tree exploration can be done in the next few days.

DR. ZOLLINGER: Why not go ahead with the operation at once? Can't the pathologist give you the answer right away? Why should you wait to explore a day or two later? Can't you tell from a frozen section from a nice piece of liver?

DR. GOLDBLATT: From a "nice" piece of liver I think we could make a diagnosis, yes.

DR. ZOLLINGER: Dr. Wheeler, why don't you take a nicer piece of liver after this and go ahead with the operation instead of operating on the baby two days in a row?

DR. WHEELER: We take a good slice of liver, but our pathologist is unwilling to "stick his neck out" in regard to a frozen section, and I do not know that I blame him.

DR. ZOLLINGER: Have you ever seen a youngster who had atresia of the bile duct benefited by surgery?

DR. WHEELER: Certainly, there are some who are completely cured.

DR. ZOLLINGER: In your experience in the past 10 years, how many youngsters do you know who have had proved congenital atresia and have been operated on and are running around?

DR. WHEELER: There are not very many who have been operated on before the age of three months during the past 5 or 10 years. The reason we do not see more cures is because we have been operating too late.

Tranquilizing Drugs

DR. ZOLLINGER: Dr. Rossmiller, without mentioning drugs by name, have you observed a number of patients who have received tranquilizers and have become jaundiced? Do you think this is a problem today?

DR. ROSSMILLER: It definitely is. Early in the use of tranquilizers, two of my patients underwent surgical exploration. In my opinion, the drug in question should not be used

unless there are definite indications for it. After all, there are a lot of tranquilizers on the market that do not cause jaundice—and phenobarbital is a good drug.

DR. ZOLLINGER: You mean it is just as good as some of these others?

DR. ROSSMILLER: I think so.

DR. ZOLLINGER: I thought there were some laboratory discrepancies that would help distinguish these problem cases. Do you subscribe to that?

DR. ROSSMILLER: I do not believe that laboratory determinations will make it possible to distinguish between a case of obstructive jaundice and a case of jaundice due to this particular tranquilizer. If the alkaline phosphatase is low, that finding is helpful, but an elevated alkaline phosphatase is not.

DR. ZOLLINGER: Dr. Goldblatt, do you agree?

DR. GOLDBLATT: I do. In both instances the jaundice really is obstructive. One is the intrahepatic obstructive type and the other is extrahepatic, and they overlap.

DR. ZOLLINGER: I thought that one of the big things in a differential diagnosis from a laboratory point of view was the finding of a high alkaline phosphatase and quite a low level of cholesterol esters (below 50). In other words, this is a conflicting situation in that the elevated alkaline phosphatase supports obstructive jaundice while the low cholesterol ester value supports hepatocellular disease. Such bizarre laboratory findings combined with a history of drug intake and a little needle biopsy should keep mistakes to a minimum.

Dr. Rossmiller, should we restrict the use of these drugs?

DR. ROSSMILLER: The particular drug that we have in mind should not be used as widely as it is today.

Questions and Answers

DR. ZOLLINGER: We have only a few minutes left to answer some questions from the floor and clarify some points.

When the diagnosis is not clear and you are not sure whether a patient has medical or surgical jaundice, how long do you wait before you advise exploration?

DR. WARREN: Approximately three weeks.

DR. ROSSMILLER: We ought to give the patient that much time for further evaluation of the tests.

DR. ZOLLINGER: Would you keep him in the hospital for three weeks?

DR. ROSSMILLER: That isn't necessary if the patient can come to the office for serial tests.

DR. ZOLLINGER: Dr. Warren, is there any special preoperative preparation for a jaundiced patient who cannot eat very well and who has lost 15 or 20 lb. in a month or so? Would you have him eat rock candy, give glucose intravenously each day, or what would you do to get him ready?

DR. WARREN: We prepare these patients in a rather elaborate manner. We emphasize the restoration of blood volume. We prescribe 2500 or 3000 calories a day, and if the patient will not take the necessary food orally we supplement the diet with intravenous feedings. One thing that we believe to be helpful is to give more fat in the diet than was allowed formerly.

DR. ZOLLINGER: In other words you permit them to have some fat?

DR. WARREN: Roughly 80 gm. a day.

DR. ZOLLINGER: If a patient refuses to eat, you put a tube in his stomach and feed him, up to 2000 calories per day?

DR. WARREN: We seldom do that. Generally we supplement the diet by giving glucose intravenously. Generally, these patients will take a high carbohydrate, high protein diet with 80 gm. of fat. One of the difficulties with the diet formerly used was that it did not contain enough fat to be palatable.

DR. ZOLLINGER: Dr. Rossmiller, do you have any special method for preparing these patients for operation?

DR. ROSSMILLER: I don't think we prepare them as elaborately as Dr. Warren mentioned. We worry particularly about the level of prothrombin concentration. As a general rule, I do not think we give these patients a lot of preparation.

DR. ZOLLINGER: You do not try to make them eat candy or deny them fat in their diet?

DR. ROSSMILLER: We try to have them eat an adequate diet, certainly, and we do not

restrict fat a great deal. The limit is about 100 gm. I realize that in the literature there is much talk about feeding these patients 3000 to 4000 calories a day, but if you keep a diet diary for them you will find that you are doing pretty well if you can get 2500 calories into them daily.

DR. ZOLLINGER: Dr. Goldblatt, how long does the liver show evidence of involvement after an attack of hepatitis?

DR. GOLDBLATT: As far as pathologic changes are concerned, a relatively short time. Certainly in about one or two months a great deal of restoration has occurred. But the clinical manifestations may continue for many months.

DR. ZOLLINGER: How frequently do you think we should repeat liver function tests in persons who have had hepatitis?

DR. ROSSMILLER: Once the jaundice has disappeared, one ought to check the liver function every two or three months.

DR. ZOLLINGER: And one should do three or four function studies such as alkaline phosphatase, and so on?

DR. ROSSMILLER: I use the BROMSULPHALEIN® test when the jaundice is gone, and the cephalin-cholesterol flocculation. More recently I have used the serum transaminase, which I think is going to have considerable worth in evaluating these patients so far as activity or lack of activity of hepatitis is concerned.

DR. ZOLLINGER: Should they be on any special diet?

DR. ROSSMILLER: They should follow a well-balanced, nutritious diet.

DR. ZOLLINGER: What is a well-balanced, nutritious diet?

DR. ROSSMILLER: Anywhere from 80 to 100 gm. of protein, and—

DR. ZOLLINGER: Won't they eat what they please—bread, butter, milk, potatoes?

DR. ROSSMILLER: You can sit down and talk to them about the situation and tell them you believe that this is the best protection for the liver.

DR. ZOLLINGER: Do you give any supplement such as protein concentrates or sugars?

DR. ROSSMILLER: I do not.

DR. ZOLLINGER: What about the use of alcohol by persons who have had liver trouble?

DR. GOLDBLATT: I don't give alcohol to my "patients."

DR. ZOLLINGER: What about hard work? If a man whose job entails hard labor has a severe attack of hepatitis, how long will he be out of work, as a rule?

DR. ROSSMILLER: I think he should avoid hard work until the results of laboratory tests are fairly normal.

DR. ZOLLINGER: Dr. Rossmiller, differentiate cholangiolitic jaundice from obstructive or surgical jaundice.

DR. ROSSMILLER: I think it is impossible without exploration.

DR. ZOLLINGER: Dr. Warren, do you agree?

DR. WARREN: Largely, yes; it is extremely difficult.

DR. ZOLLINGER: Dr. Warren, do you use intravenous cholangiography in the presence of jaundice?

DR. WARREN: Not if the bilirubin is above 3.5 mg. per cent, and then not if the jaundice has been present a long time.

DR. ZOLLINGER: If the patient is yellow, you wouldn't use it, would you?

DR. WARREN: Yes. Some of the most interesting cases that one will observe will be of patients with low grade jaundice of short duration. We have some very dramatic intravenous cholangiograms from some of these borderline cases.

DR. ROSSMILLER: I have seen them.

DR. WARREN: There is support from the medical department!

DR. ZOLLINGER: The jaundice is pretty mild.

DR. WARREN: I gave you the limits.

DR. ZOLLINGER: It is almost within normal limits, I would say.

We haven't mentioned amylase. Do you ever worry about amylase determinations in the presence of jaundice? Dr. Warren, you have written a lot about pancreatitis.

DR. WARREN: I worry about it if I suspect pancreatitis. A very small percentage of patients who come in with what appears to be obstructive jaundice will have pancreatitis, but any patient with acute upper abdominal pain should have amylase determinations.

DR. ZOLLINGER: Dr. Wheeler, how do you

interpret complete absence of bile in the stool and in the urine in a newborn infant with increasing jaundice?

DR. WHEELER: I do not know that it would be absent in both stool and urine. Absence of bile in the stool of a newborn infant would tend to make one think of obliteration of the bile ducts, but in the first week these babies do not become very yellow and one cannot detect it very well. By the second or third week there ought to be bile in the urine. certainly.

DR. ZOLLINGER: Dr. Rossmiller, would you give bile salts along with vitamin K in the presence of obstructive jaundice?

DR. ROSSMILLER: Usually one does not give vitamin K other than parenterally. If one is going to give it orally, it is probably wise to give a little bile along with it so that the vitamin K will be absorbed.

DR. ZOLLINGER: Dr. Warren, would you give bile salts orally to a deeply jaundiced patient?

DR. WARREN: No. I think if they are deeply jaundiced they should be given vitamin K parenterally.

Conclusion

DR. ZOLLINGER: Dr. Goldblatt, do you want to sum up the problem of jaundice? You have taken a very broad view of this problem, and we clinicians are comforted that you are perfectly willing to run many tests.

DR. GOLDBLATT: An understanding of jaundice definitely depends on a clear concept of the classification and on a thorough knowledge of all the conditions which may play a part, singly or in combination, in its pathogenesis—from changes in the blood to impairment of the liver cells, to intrahepatic and extrahepatic obstruction, to the outflow of bile into the intestine.

DR. ZOLLINGER: Dr. Warren, what do you wish to say?

DR. WARREN: I would say that these patients should be studied carefully on the basis of the history and physical examination, with an attempt ultimately to categorize their condition with the aid of laboratory tests which have been outlined. I would like to emphasize one point: There is a great horror of operating on a patient with hepatitis, and that is justifiable. On the other hand, if these patients are prepared carefully and if after three weeks you cannot be certain regarding the type of jaundice, abdominal exploration is indicated.

DR. WHEELER: I am beginning to think that jaundice is a pretty complex problem, and after listening to the other panel members I am glad that as pediatricians we do not have many problems compared with those facing them.

DR. ROSSMILLER: I think that when all is said and done there will be a small group of patients, probably somewhere up to 5 per cent, who, in spite of the carefully taken history, thorough physical examination, all the laboratory studies, serial studies and so on, in the end will require surgical exploration for purposes of diagnosis.

DR. ZOLLINGER: We should keep in mind the fact that it is very worthwhile for the clinician to make a definite diagnosis before the laboratory tests are started. There is a tendency to underestimate the value of the history and physical examination and to wait for the results of the laboratory tests to reveal the diagnosis. The laboratory data should be used to confirm or deny the clinical impression. In other words, every physician should have a set policy for investigating a case of jaundice. Instead of going from one test to the other, we casually examine the patient while ordering a repetition of an extensive battery of laboratory tests.

The laboratory test results should be recorded on one sheet of paper with the findings supporting hepatitis on one side and those favoring obstructive jaundice (if a surgical type) on the opposite side. We have called this a "jaundice balance sheet," and I recommend its use.

I have gained the impression from this discussion that laboratory tests are not very reliable (I had more confidence in them), and that perhaps we should not be too afraid of surgical exploration if jaundice persists at least three weeks and the diagnosis remains obscure.

CLINICOPATHOLOGIC CONFERENCE

Report From Veterans Administration Hospital, Hines, Illinois

Report of Case

A 45 year old white man, who was employed as a salesman of floor machines, entered the hospital June 15, 1954, with a history of massive hemorrhage from the mouth occurring five hours before admission. The amount of blood lost was not recorded. The patient fainted after the hemorrhage and was brought to the hospital as an emergency. He stated that for 15 years he had had intermittent epigastric distress noted during periods of stress. This pain was relieved by "baking soda" until three months earlier, when the pain persisted despite antacid therapy. He placed himself on a diet in which he eliminated certain foods (not listed) and alcohol and restricted his smoking. This regimen failed to help. Approximately two months before admission he began to be nauseated in the evenings and after a while this was accompanied by vomiting. Blood streaks were noted in the vomitus on several occasions. One month earlier he saw his family physician who placed him on medication (type not described) with no relief. X-rays of the stomach, taken a week later, revealed ulcers (site unknown), and subsequently gastroscopic examination was performed. Operation was advised. A search for malignant cells in the stomach washings was reported as negative. The patient also stated that he had black stools which were "sticky and tarry" for 10 days prior to hospitalization.

The patient smoked one carton of cigarettes per week and drank four to five bottles of beer daily before the onset of his present illness. Past medical history revealed that the left eye was enucleated in January 1951.

Physical examination revealed a well-developed, well-nourished white man who was quite pale but alert and cooperative. Blood pressure was 118/74, and pulse rate was 108 and regular. The head and neck were normal as were the ears, nose and throat. Examination of the chest revealed equal bilateral excursions. The lungs were clear to auscultation and percussion. The heart was of normal size and no murmurs were heard. The heart rate was 108 beats per minute and the rhythm was regular. The abdomen was obese; no masses or organs were

palpated. There was epigastric tenderness to palpation, and some guarding was noted. Bowel sounds were normal. The genitalia were normal. Rectal examination revealed a smooth, firm, nontender prostate. There was no stool in the rectum.

Laboratory data—On June 15, hemoglobin was 10.5 gm.; red blood cell count 3.4 million; white blood cell count 21,000; differential showed 80 neutrophils, 12 lymphocytes and 8 monocytes. Hematocrit was 33 per cent. During the next few days the white cell count varied from 13,700 to 24,300; the hemoglobin, from 10.5 to 11 gm.; and the hematocrit from 30 to 35 per cent. On June 22, the hemoglobin had risen to 13 gm. with a hematocrit of 40 per cent. Urinalysis revealed a specific gravity of 1.024, no sugar or albumin, and normal cytology. Blood chemistry tests showed the serum bilirubin to be less than 0.5 mg. per cent, alkaline phosphatase 14.2 Bodansky units, thymol turbidity 2 units and prothrombin time 13 seconds (100 per cent). On July 9, the nonprotein nitrogen was 41.7; total protein was 6.5 gm. per cent with 3.4 gm. albumin and 3.1 gm. globulin. Bleeding and coagulation times on June 25 were normal. An electrocardiogram made June 18 revealed sinus tachycardia. X-ray of the chest on June 15 disclosed a right pleural effusion and questionable cardiomegaly. Repeat film on June 18 was interpreted as indicating subsiding right pleural effusion and marked cardiac enlargement. On June 26, the film revealed cardiac enlargement, pleural effusion and pleural thickening at the right base, with a small amount of pneumothorax at the right base laterally. A film made on July 9 revealed a marked increase in the right pleural effusion. Serial films of the gastrointestinal tract on June 17 revealed an enormous ulceration of the greater curvature of the pars media with a questionable mass and widening of the mucosal folds.

Clinical course—Therapy started with intravenous administration of fluid (glucose in water), followed by transfusion of 100 cc. of whole blood. Gastric aspiration by means of a Levin tube was performed every morning and evening. The patient was placed on an ulcer diet and received antacids and milk and cream hourly. Sedation was also prescribed. Following the gastrointestinal series on June 17, he complained of abdominal and chest pain. He passed a black stool on June 17. Continuous suction was then started, as well as intravenous administration of fluids. By June 21 he had improved sufficiently to have the Levin tube removed and to be placed on milk and cream and antacid therapy. On June 22, thoracentesis was performed and 60 cc. of yellow cloudy fluid was obtained. Culture of this fluid was negative. The liver was palpated on June 27 and a liver biopsy performed on June 30. The biopsy specimen was described as showing fatty metamorphosis. Abdominal paracentesis was performed on July 9, with removal of a large amount of cloudy, yellow-green fluid. On July 12, marked dyspnea developed and there were moist rales in both bases. Respirations gradually slowed and the patient died at 3:05 P.M., July 12, after 27 days in the hospital.

DR. GEORGE OLANDER (attending surgeon): When I first read this protocol, I wondered why this patient was not operated on at some time during his 27 days in the hospital. In brief, the history is that of a 45 year old white man who was admitted to the hospital with an episode of gastrointestinal bleeding and a past history of ulcer symptoms for which he was treated by his own physician, with recent failure to respond to treatment. The bleeding apparently subsided and complications of pleural effusion, ascites and an enlarging liver developed.

The only point in his past history mentioned was that he had had an eye removed in 1951. I asked an ophthalmologist why enucleation of an eye would be done at the age of 42. Principally, it is done because of trauma—either direct trauma destroying the eye, or indirect trauma, that is, an ulcer of the cornea with erosion and destruction of the eye. Also, enucleation is done for primary tumors; obviously, enucleation is not done for metastatic tumors, because the disease process itself usually is so extensive that an enucleation does not benefit the patient. The primary tumors of the eye are melanomas and enucleation is

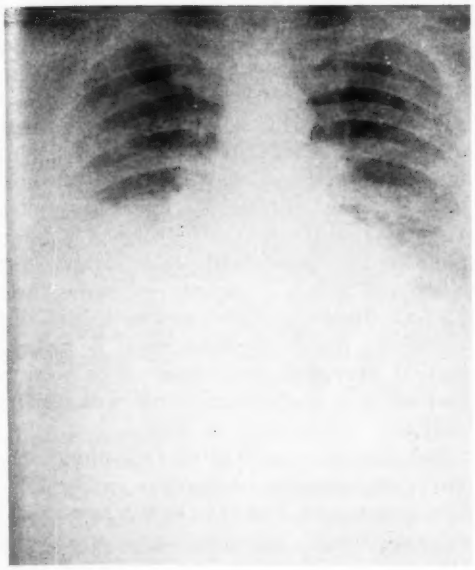

FIGURE 1. Posteroanterior chest film showing pleural effusion in right base.

done for that particular condition. I remember one case at this hospital in which the time interval between the enucleation of the patient's eye and the time of his death was four to five years. At that time, his liver became large and, with his particular metastasis, the substance of the liver was almost replaced by tumor without producing the umbilicated nodules that we see in tumor metastases in the gastrointestinal tract.

The laboratory data that we have are not characteristic of any one condition. He had a persistent elevation of the white blood cell count; his red blood cell count and hematocrit reflected the gastrointestinal bleeding; and he had an elevated alkaline phosphatase. There were no bone lesions to account for the elevated alkaline phosphatase, and the absence of jaundice reduces the chances of extrahepatic or intrahepatic biliary tract obstruction. Another cause of elevated alkaline phosphatase is metastatic liver disease. Pleural effusion developed on the right side with x-ray evidence of pneumothorax following a thoracentesis. I would like to know whether or not the enlarged heart shadow seen on x-ray was due to pericardial effusion or to actual myocardial hypertrophy or dilatation. In a 45 year old patient with a normal blood pressure, no history of edema before he came into the hospital, and a normal electrocardiogram, I would think that perhaps he had a pericardial effusion. May I see the x-rays?

X-RAY INTERPRETATION: There is a homogeneous opacity over the lower half of the right lung field (figure 1). On the lateral film this is noted to be both anterior and posterior. The left lung field is clear. This is consistent with marked pleural effusion at the right lung base. The enlargement of the heart shadow is true cardiac enlargement with measurements estimating a deviation of over 25 per cent.

In the gastrointestinal series, the esophagus and duodenum are normal. There is a large ulceration on the greater curvature of the stomach with marked widening and distortion of the mucosal folds (figure 2). In addition, there is a questionable mass in this region.

FIGURE 2. Upper gastrointestinal film showing a large ulcer on the curvature of the stomach.

DR. OLANDER: Thoracentesis was performed and is reported as yielding a greenish-yellow fluid. Was a cell block done?

DR. DONALD FOX (pathologist): A cell block was done and the report was "atypical cells."

DR. OLANDER: Without placing too much emphasis on this point one way or another, the lining cells of the thorax can, at times, appear atypical. Unless you find clumps of cells or cells producing a definite pattern, the diagnosis of tumor is difficult. Enlargement of the liver also developed, or at least the liver became palpable. An aspiration biopsy of the liver was reported as "fatty metamorphosis." The accuracy of diagnosis on liver biopsy by needle aspiration is only as good as the accuracy of the needle placement. In spite of the liver biopsy report, the picture does not represent to me a patient with hepatocellular disease and enlargement of the liver on that basis. It is true that he had some history of alcoholism, but, considering the elevation of alkaline phosphatase, his constant fever, the enlargement of his liver with a pleural effusion on the same side, and the previous enucleation of his eye, I think we have to consider metastases in the liver. The reason I said I wondered why he wasn't operated on earlier is that his large ulcer was on the greater curvature of the stomach; he had had a long history of gastric distress; and he had had gastrointestinal bleeding. Therefore, it seemed to me that his abdomen would have been explored. The ulceration on the greater curvature could have been due to metastatic tumor, but I think we also have to think of a carcinoma arising in this area. Ascites developed three days prior to death and an abdominal paracentesis was performed. Do we have any information on this fluid?

DR. FOX: No.

DR. OLANDER: Why did the physicians on the ward do the aspiration if they didn't look for something?

DR. FOX: I believe the patient was having some abdominal distress and they were trying to alleviate that.

DR. OLANDER: I think it is important that, if you're going to aspirate fluid from any cavity in a diagnostic problem, to find out the character of the fluid, because that helps in making a diagnosis.

To summarize, we have a patient who was 45 years old, who had a long-term history of gastric distress, and who had a known ulcer on the greater curvature of the stomach which bled rather profusely on one occasion and continued to bleed during his stay in the hospital. He had an elevation of his alkaline phosphatase, a continued elevation of his white blood cell count, a rapidly enlarging liver, pleural effusion, and then ascites. I think that the most probable diagnosis would be melanomatous ulceration of the stomach or possibly carcinoma of the stomach with metastasis to the liver.

DR. EDWARD WILLOUGHBY (attending internist): Dr. Olander commented on the value of a liver biopsy. I did the liver biopsy, and I think that my clinical judgment was better than my judgment after I did the liver biopsy. I was of the opinion that the man probably had a carcinoma of the liver, metastatic from the enucleated eye tumor. I also felt that the outside impression of carcinoma of the stomach was correct, so that it was a matter of deciding which, or both, of the tumors was metastatic to the liver. A good specimen of liver tissue was obtained by biopsy and it appeared normal, without abnormal pigmentation or any evidence of carcinoma. When carcinoma cells were not found, we were planning to repeat the biopsy, but, by that time, his condition had deteriorated, and we felt we could add nothing to the man's outcome by a precise diagnosis.

DR. FOX: Autopsy showed a 45 year old white man, who was well developed and well nourished. There were no skin lesions. There was 1500 cc. of clear fluid in the right pleural cavity, and the right lung was atelectatic. Tumor nodules were seen on the surface of the right lung, especially over the right lower lobe. In the abdomen, there was 750 cc. of clear fluid. The stomach was involved in a large tumor mass which extended out to involve the pancreas and the omentum, and there were also peritoneal metastases. The stomach was adherent to the liver, and on the greater curvature of the stomach there was an ulcer

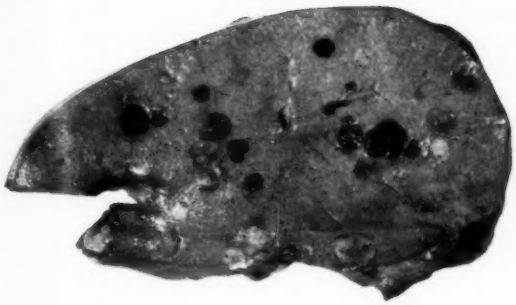

FIGURE 3. Cut section of gross specimen of liver showing black and white nodules of malignant melanoma.

which measured 4 cm. in diameter. The liver weighed 4600 gm., an enlargement of three times the normal size, but not especially enlarged for a melanoma, as livers which are the site of metastases from melanoma commonly weigh up to 6000 gm. The liver was pallid and displayed many nodular tumor metastases, some black and some white (figure 3). It is quite common that some metastases from melanoma are white while others are black; also, some nodules may be mixed in color. There were also numerous tiny metastatic nodules on the serosa of the small bowel.

Microscopically, the metastatic tumor in the liver presented an anaplastic picture with large amounts of melanin within the liver cells, especially in necrotic areas (figure 4). Tumor metastases also were seen in the stomach, regional lymph nodes, peritoneum, spleen, adrenals and lungs. We were unable to secure a specimen of the patient's eye. Malignant melanoma involving the eye arises from the choroid in 76 per cent of cases, and in approximately 11 per cent of cases it stems from the iris and ciliary body. These tumors extend by nerve pathways from the eye locally, but the metastases are generally vascular.

In summary, then, this patient had a malignant melanoma of the left eye which was enucleated in 1951; the metastases in the stomach were definitely from the melanoma with the histology in the stomach and in the liver being similar. The time period between eye enucleation and appearance of metastases is very common—actually the most common time period for metastases. The stomach as a site of metastasis from melanoma is mentioned, but this is rare. Willis, in his book on metastases, "The Spread of Tumors," cites cases where the tumors have metastasized to the small bowel, including the duodenum. He feels that

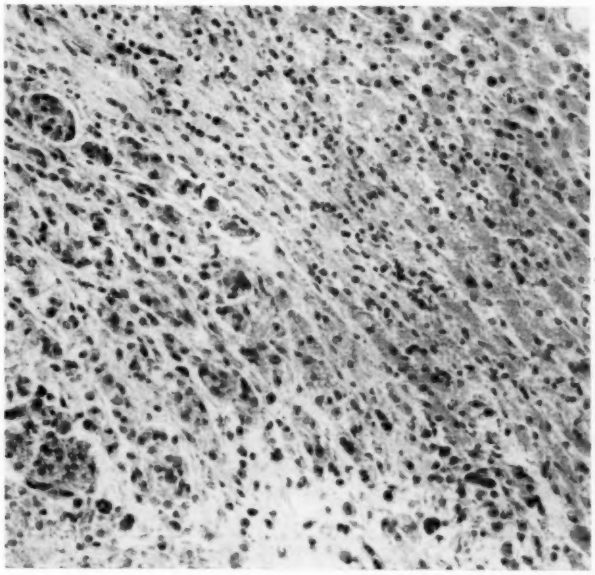

FIGURE 4. Photomicrograph of liver showing malignant melanoma on the left and liver tissue on the right.

the spread is hematogenic. In such cases of metastasis to the bowel, common symptoms are those of intestinal obstruction. Metastases to the lung are accompanied by effusion, producing lung compression and dyspnea. Metastases to the peritoneum are associated with ascites, and metastases to the liver produce hepatomegaly. Death is usually due to generalized metastases in these cases. We were unable to find an embolus or any of the usual causes of sudden death in this case.

DR. I. E. KIRSH (X-ray department): We were surprised to know that there was a melanoma, but not surprised to learn that it was malignant. We have found that most greater curvature ulcers that appear benign radiologically are benign histologically. I have studied a consecutive series of 120 benign and 22 malignant gastric ulcers with histologic proof. There were eight greater curvature ulcerative lesions of which six were benign. An interesting fact is that the two malignant greater curvature ulcers showed radiographic evidence of malignancy. Another feature which in the past has been considered an indication of malignancy is large size of crater. This criterion has also been shown to be unreliable in my analysis. The x-ray impression of malignancy in the case presented here was based on the filling defect and abnormal mucosal folds —two important signs of malignancy.

PHYSICIAN: Figures show that malignant melanoma metastasizes frequently to the heart. Was this the case here?

DR. FOX: No, there were no metastases to the myocardium.

DR. WILLOUGHBY: Did you mention any enlargement of the heart?

DR. FOX: There was no pericardial effusion. The heart weighed 400 gm., which is slightly enlarged, but histologically it really did not show anything significant.

1957

INTERSTATE POSTGRADUATE MEDICAL ASSEMBLY

Sept. 30-Oct. 3 Palmer House Chicago, Illinois

John Adriani, M.D., Professor of Surgery, Tulane University School of Medicine; Clinical Professor of Surgery and Pharmacology, Louisiana State University School of Medicine, New Orleans

Accidents Following the Use of Local Anesthetics

Local anesthetics are some of the most dangerous drugs employed by physicians. They cause more deaths than any other group of drugs. Most reactions to local anesthetics result from indiscriminate use of excessive quantities. Any situation which favors the rapid build-up of a high blood level leads to a reaction. More reactions follow topical application than other routes of administration. Overdosage causes central nervous system stimulation characterized by convulsions or circulatory failure. Symptoms of reactions due to allergy intolerance are entirely different. The latter are rarer causes of a reaction.

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PITFALLS IN THE MANAGEMENT OF DIARRHEAL DISEASES

PHYSICIANS must become cognizant that there are numerous chronic cases of diarrheal diseases in their communities. Patients so affected urgently require more specific care if they are to be saved from chronic physical and mental invalidism. It is admittedly true that physicians in general do not like to treat diarrheal diseases. The etiologic diagnosis involves complex and unpleasant technical procedures. The management and treatment are time-consuming, complicated and often disheartening. The work, to say the least, is unappealing. Nevertheless we must face the issue. The responsibility for the care of these unfortunate patients lies within our profession. The etiologic diagnosis cannot be waved away on the basis of a "nervous stomach" or an intestinal "virus," nor can the treatment be concluded with a prescription for paregoric.

There are several points to be considered. Is the general practitioner unaware of the seriousness of a persistent diarrhea? Is there insufficient undergraduate and postgraduate instruction, or ineffective dissemination of facts pertaining to the management of diarrheal diseases?

The examination of a freshly passed or aspirated stool specimen for inflammatory cells, ova, parasites or other intestinal pathogens is often neglected. The physician must remember that a stool containing barium, sulfonamide drugs, antibiotics or suppositories is not a fit specimen for gross, microscopic or reliable cultural studies.

The proctologist is certainly aware that ulcerative colitis and carcinoma of the rectum or sigmoid are not uncommon causes of rectal bleeding. Nevertheless, hemorrhoidectomies are still being performed without first determining the true source of the bleeding.

The management of diarrheal diseases also plagues the pediatrician. For example, great caution is required in the diagnosis of celiac disease. This diagnosis cannot be supported merely by glancing at the stool specimen through a glass jar. The finding of gross or microscopic pus and blood nullifies such a diagnosis. It takes very little time to examine a fecal suspension microscopically, and yet very few physicians do it.

Operation is not the solution to the problem of chronic ulcerative colitis. Too many patients are led to believe that surgery has the cure for this disease. This belief is erroneous. Every surgeon knows that intervention in chronic ulcerative colitis is indicated only when severe complications arise. In fact, the increase in the number of colectomies performed in recent years has tended to discourage research and to lessen interest in medical therapy. The medical profession is cautioned against indiscriminate employment of total colectomies in this disease. The time-honored golden rule applies here.

WILLIAM Z. FRADKIN

WHO OWNS THE ROENTGENOGRAMS?

THIS question of the ownership of roentgenograms is one which constantly occurs in discussions between doctors and patients, doctors and hospitals, hospitals and patients, and lawyers, insurance companies and public officials. A succinct answer has been given by *New York Medicine*,[1] which opens its statement sharply: "Roentgenograms of a patient obtained by a roentgenologist in his private office are his property, and not the property of the patient." The second portion of the question is then answered: "Roentgenograms of a patient obtained in a hospital are the property of the radiology department and not the property of the patient." Many court citations are provided by *New York Medicine* to sustain these two opinions.

Obviously the reasons behind these statements also are of interest. The roentgenologist retains roentgenograms as a part of his total experience and for comparison with future studies of the same patient and of other patients. The patient himself is seldom capable of evaluating the roentgenogram, and it would mean nothing to him to have it. The patient buys from the roentgenologist not the film itself but the opinion of the roentgenologist as to what is seen in the film.

Valuable also is the opinion of *New York Medicine* as to how long roentgenograms should be kept. They should be filed and made readily accessible for at least five years for purposes of comparative study with other roentgenograms taken later. In the case of minors, roentgenograms should be kept for two years or more after the child has attained his majority in accordance with the limitation periods of various states.

The roentgenograms are filed as part of the hospital records, and are then available in that hospital to the patient's doctor or to other doctors for study at any future date.

Recently, the question of the ownership of roentgenograms has become a matter for legal concern because of the necessity for submitting roentgenograms in relationship to decisions made under the laws of the Workmen's Compensation Act. When the patient is subject to such laws, the roentgenograms and a copy of the report should be given the carriers in the case. Roentgenograms are subject to subpoena as are other hospital records.

Following these legal decisions come the opinions as to what might be considered accepted custom and practice. "Upon written request from the patient or authorized agent of the patient and promise to return the roentgenograms, they shall be made available to other hospitals for study and comparison." However, the final opinion is the one which really should govern all decisions: "Exceptions to these recommendations shall be made only when it is in the best interest of the patient." After all, the best interest of the patient must determine the decisions in every question that arises. Roentgenologists and physicians who are in possession of films affecting any patient must make these decisions always with the best interests of the patient in mind. Even were this not the case, the ethical principles of medicine would demand that the roentgenologist confer courteously with his colleagues and with other physicians; his possession of roentgenograms should not cause him to wield influences that are unfavorable or greedy or that would exploit any patient.

MORRIS FISHBEIN

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SIR VICTOR HORSLEY—A CENTENARY

THE British Medical Association celebrated recently the hundredth anniversary of the birth of Victor Horsley, one of the most distinguished surgeons in the history of medicine. Three papers and an editorial are included in the *British Medical Journal* (April 20, 1957). The first paper is an excellent review by Sir Geoffrey Jefferson, emeritus professor of neurosurgery at the University of Manchester, of the life and work of the great scientist and practitioner. Sir Arthur MacNalty, who studied with this noted brain surgeon, contributes the second discussion of the character and work of Sir Victor Horsley. The final essay in the series, by Ernest Sachs, St. Louis, comprises a number of reminiscences of the time when Ernest Sachs studied with Horsley, to whom he was sent by Harvey Cushing. All this makes for a complete and beautiful presentation of a type which appears all too seldom in American medical periodicals. Although we are a young country, we too have our eminent pioneers. Far too seldom do we remind the younger generation of the accomplishments of our leaders and the difficulties over which they triumphed.

Victor Horsley was born April 14, 1857. His father was a distinguished artist, his mother the sister of Sir Francis Seymour Haden, an eminent surgeon and etcher.

Sir Victor Horsley was a pioneer in experimental and neurologic surgery. He was probably the first surgeon ever to remove a tumor of the spine, but was distinguished no less for his fundamental experiments on the pituitary gland, his operations for trigeminal neuralgia, and especially for his studies of the physiology of the brain. His experimental laboratory, which was at No. 25 Cavendish Square, was said to have been the model for the description by Robert Louis Stevenson of the laboratory of Dr. Jekyll in "The Strange Case of Dr. Jekyll and Mr. Hyde."

In 1900 Harvey Cushing visited Victor Horsley and witnessed a demonstration of the manner in which Horsley operated on the gasserian ganglion. Horsley was a rapid operator in contradistinction to Harvey Cushing, who was more deliberate. By the time of Cushing's leadership, methods and technics had improved to the extent of affording more possibility of deliberate performance.

In his comment, Sir Geoffrey Jefferson contrasts the places of Horsley and Cushing in the field of brain surgery. Without chauvinism he claims, probably rightly, that Horsley deserves to be called the father of brain surgery. Thus he says, "It is not greatly to be wondered at that Harvey Cushing found little to admire and nothing to imitate in this great Englishman. Their lines of interest diverged too far. Horsley's preoccupation was within the intimate structure and physiology of the nervous system. Cushing's was not; it was more practical. . . . The details of operative surgery Horsley thought important, but not important enough to deserve much publication. Cushing, on the other hand, was much more interested in the immediate present, in technical improvements in a field which was ripe, if mortality was to be reduced and the rate of cure raised, for a change in method. His great gifts were better canalized than Horsley's, but had he been more generous to the older man it would have been more seemly and more just."

Sir Victor Horsley was an ardent crusader in social causes, having aligned himself with reformers in the battle for teetotalism, for women's suffrage, and for vivisection; he was also an opponent of tobacco. He was a leader in forming policies of the British Medical Association in regard to reform of coroners' laws and death registration, medical inspection and treatment of school children, a national health service, the state registration of nurses, and the suppression of unqualified practice and quack advertisements. As a result of his enlistment in these political wars, his practice suffered greatly, as did that of William Harvey, when he devoted himself to physiologic research and discovered the circulation of the blood some 300 years previously.

Peculiarly, Sir Victor Horsley believed that one who had not taken alcohol could not suffer heat stroke. Unfortunately, he died of heat stroke after having been an uncompromising opponent of alcohol for many, many years.

He died in Mesopotamia during World War I in 1916. An officer who was with him told Dr. Ernest Sachs that Sir Victor Horsley had refused to wear the helmet or spine pad required of all personnel in the British Army as a protection against heat stroke. Foolhardy, perhaps, but praiseworthy in a man who had the courage to follow his convictions.

MORRIS FISHBEIN

PSEUDOHERMAPHRODITISM

ACCORDING to Drs. Alvin B. Hayles and Robert B. Nolan[1] of the department of pediatrics of the Mayo Clinic and the Mayo Foundation, only two instances have been reported in medical writings of cases in which androgenic hormones administered during pregnancy produced masculinizing effects on human female infants. A woman with sarcoma of the breast was given 100 mg. of methyl androstenediol intramuscularly twice each week, beginning in the sixth month of pregnancy. She gave birth to an infant with pseudohermaphroditism. Another prospective mother was treated for pruritus, by the administration of 845 mg. of DEPO® testosterone, from the fourth month of pregnancy to delivery. The infant was born with a striking enlargement of the clitoris and changes in the labia which made them resemble the male scrotum.

Now, a third case is reported from the Mayo Clinic. This infant was born to a 27 year old woman who previously had given birth to two normal female infants. About the third month of pregnancy the mother consulted a physician because of alopecia. He prescribed the use of methyltestosterone LINGUETS® (10 mg. each), one to be taken twice daily. This dosage was continued until the day before delivery. After starting to take the testosterone, the woman noted deepening of the voice and the development of hirsutism, including masculine distribution of the sex hair and partial regrowth of the hair in the areas of baldness. During this time also, the mother's clitoris enlarged. When the infant was born, it was found to have a fairly large phallus with the urethral opening at its base. Indeed it was thought to be a male infant. Examined at the age of seven months, the baby appeared to have a phallus and a scrotum, but gonads were not palpable. The complete examination indicated a diagnosis of female pseudohermaphroditism.

While proof of the relationship between the hormones given and the anomaly of the genitalia is lacking, animal experimentation on monkeys has resulted in female pseudohermaphroditism following injections of testosterone intramuscularly; similar effects of androgenic hormones have been observed in a variety of experimental animals.

The Mayo physicians conclude that "caution in administering androgens to pregnant women should be exercised." The animal experiments and the reports of the cases would make this seem to be something in the nature of understatement.

MORRIS FISHBEIN

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